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THE METAL INDUSTRY

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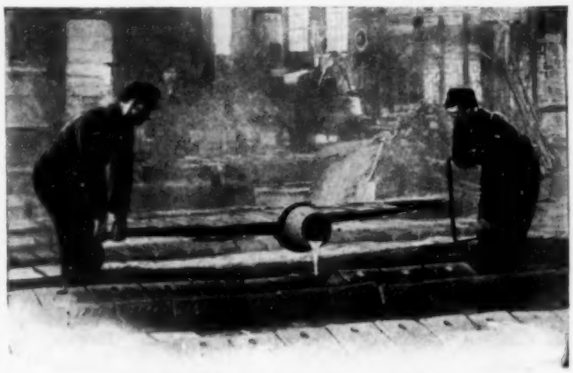

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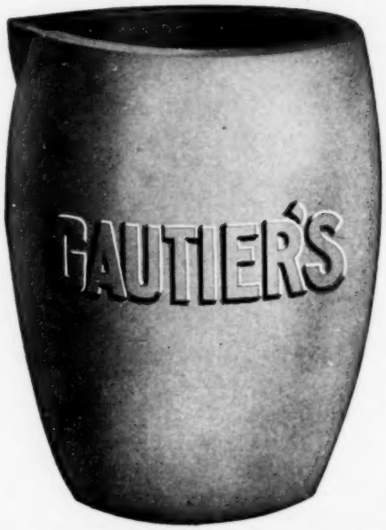

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THE METAL INDUSTRY

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ELECTRO-PLATERS REVIEW.

OLD SERIES Vol. 22. No. 9. | NEW YORK, SEPTEMBER, 1916. | NEW SERIES Vol. 14. No. 9.

THE FOUNDRYMEN'S CONVENTION

LATEST INFORMATION REGARDING THE 1916 MEETINGS OF THE ALLIED FOUNDRYMEN'S ASSOCIATIONS AND THE EXHIBITION OF FOUNDRY APPARATUS AND SUPPLIES TO BE HELD IN CLEVELAND, OHIO, SEPTEMBER 11 TO 16, INCLUSIVE.

WRITTEN FOR THE METAL INDUSTRY

BY R. E. PORTER.

CLEVELAND'S ADVANTAGES.

Cleveland, Ohio, sometimes called the Sixth City of the United States, is perhaps the most wonderful city from an industrial point of view in this country today. This wonderful industrial development has occurred almost entirely within the last decade. Two factors have made this possible. It is essentially a manufacturing city (and in this respect it is sometimes referred to as the Birmingham of America), and also essentially as a city of homes.

EUCLID AVENUE, DOWNTOWN IN CLEVELAND, OHIO.

The city was founded by Moses Cleveland in 1796, chief surveyor for the Connecticut Land Company. It became a village in 1836, with 150 inhabitants. As a city

it started with only 5,000 souls. During the early years of its growth Cleveland developed slowly. With the discovery of iron ore, and the establishment of furnaces, its real growth began. The point upon which this development turned for the upgrade, was the bringing of coal from the south and iron ore from the north to this central point.

Today Cleveland, besides being sixth in population, is second in value of production, and so far has led in the amount of war orders placed with this country. At the beginning of the year more than $100,000,000 war orders were on hand, and this amount has been added to during the last six months.

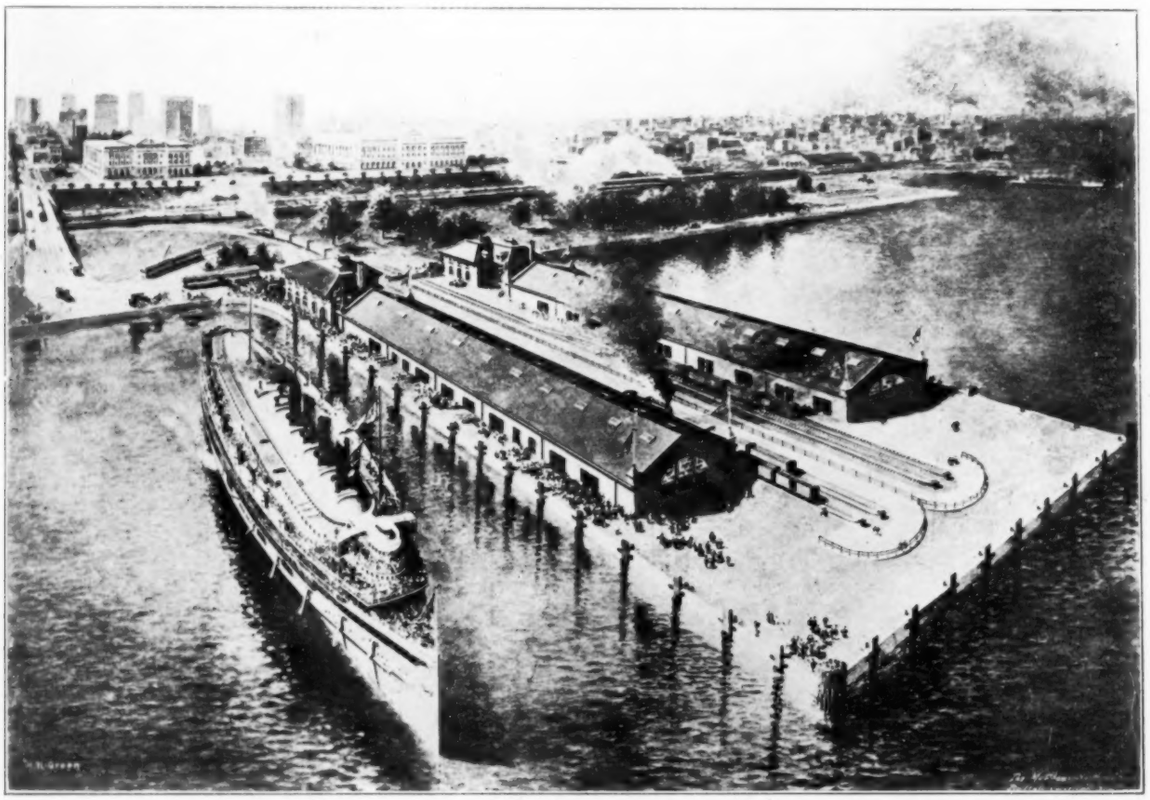
Located on Lake Erie, 600 miles from New York City and 300 miles from Chicago, the City of Cleveland, if present rate of development continues, seems destined to become the third city in importance in no great length of time.

belt line in any American city. By boat lines Cleveland has practically express service at lower rates than rail freight rates to the principal ports of the Great Lakes eight months in the year.

The railroad facilities are abundant, including practically all of the branches of the New York Central Lines, the Pennsylvania Lines, the Erie, Nickel Plate and Wheeling and Lake Erie, connecting with the Wabash system to the southwest, and the Baltimore and Ohio.

What has helped the metal industry of Cleveland as well as other manufacturing lines, more than anything else, is the use of natural gas for fuel. Natural gas is piped from West Virginia and is sold during the summer months in large quantities for generating power, at 13 cents per 1,000 cubic feet. During the winter months it is 30 cents per 1,000 feet.

Water is equally cheap, for there is the entire lake to draw upon. About 5 1-3 cents per thousand gallons is



THE NEW EAST NINTH STREET PIER, CLEVELAND, OHIO.

Opportunity for employment has been a factor in bringing the present population up to 700,000. This opportunity has been made possible by the availability of good factory sites at reasonable cost. This, combined with location with regard to markets and source of supply, good transportation facilities, good living conditions for workers, low cost of fuel, power and water, reasonable taxes—all have combined for the welfare of the community. It is conservatively estimated that more factories here work with metals than any other branches of industry, and that this metal industry produces about half of the wealth of the city.

Transportation has played an important part also. The Cleveland Short Line Railway, a belt line just completed at a cost of $18,000,000, makes a circuit of nineteen miles around Cleveland, intersecting every railroad entering Cleveland. Authorities say this is the most convenient

the charge for manufacturing purposes, which is said to be lower than that of any other city in the country, with two exceptions.

Cleveland as a convention city is gaining in importance almost daily. During recent gatherings of the building and allied interests, it was impossible for hotels to accommodate the crowds. To take care of future business of this character several new hotels are being erected, or contemplated, notably the Hotel Olmsted, Hotel Winton, Hotel Cleveland, all twelve-story structures, and additions are being completed to the Hotel Hollenden and Hotel Statler, two of the first class hostelries in the Middle West.

Opportunity for the workers to enjoy life outside of business hours is greater in Cleveland, in the belief of the city administration, than anywhere else. There are 1,800 acres of park land, two parks on the lake shore,

and thirty-five miles of boulevard. The latter are used to a tremendous extent, because, if figures are correct, more persons in proportion to the population own motor cars than in any other city.

In the parks there are no "Keep Off the Grass" signs. To Tom L. Johnson, father of freedom for the people, belongs this credit. When Mr. Johnson took office one of the first things he did was to personally tear up these signs, and to this day they have never been put back. Recreation in these pleasure spots is fostered by the city government, a Recreation Department, at present under the direction of J. F. Potts, looking after the sports of the community.

Many big enterprises are planned by the civic bodies of Cleveland, probably the biggest at present being the Public Hall. Need for such a meeting place was emphasized by the presence of President Wilson and his party here while touring the country some months ago. Only the elite could crowd into the Gray's Armory to hear the President. Since then the voters have passed favorably upon a bond issue for the erection of a $2,500,000 auditorium. Every line of business, represented in a committee of 100 organization, worked on the propaganda to push this enterprise through.

ONE OF CLEVELAND'S AUTOMOBILE FACTORIES.

Immediately following the outbreak of the European war fears were felt for business throughout the country. Some of these fears were justified here, but by no means to the extent experienced in other communities. With the coming of war orders and the placing of business for domestic interest, money has been diverted into the natural channels in an amazing manner.

Probably the most significant thing that will appeal to out-of-town delegates to the eleventh convention of the American Institute of Metals and the American Foundrymen's Association, September 11 to 16, will be the fact that the metal industry of Cleveland has doubled in the last year and a half. Government statistics are actually out of date, so rapidly has this business increased in the last eighteen months, and these figures give an entirely wrong impression of what is going on in this trade in Cleveland.

Probably the most serious phase of the situation, that might interfere with continued good business here, if manufacturers did not cope so well with the matter, is the labor shortage, which has become more marked in the last month or two. Casting shops have suffered particularly in this respect, and it might be no exaggeration to say that although they are working to capacity now, they could turn out more work if they had help.

CLEVELAND'S METAL SHOPS.

In the brass production end of the industry the Glauber Brass Manufacturing Company, with a plant at Superior avenue and East Forty-ninth street, may easily be considered the largest of its kind in the city, and certainly one of the largest in the country. Its production is exclusively plumbing brass goods, of which there is an immense variety turned out daily.

From a little shop in a two-story and basement building on what is now the site of the Baltimore & Ohio Railroad station, this establishment has grown, until today its different departments cover three and one-half acres. The business was established in 1889 by I. N. and J. H. Glauber, and later M. H. Glauber became affiliated with the firm. Fourteen years ago I. N. Glauber died, and two years ago J. H. Glauber passed away. M. H. Glauber now is president and treasurer of the company; A. I. Fischer, general manager; John McTigue, general superintendent, and Joseph Schwartz, manager of the foundry department.

When the firm was started it specialized in hose bands, but as in those days there was no establishment giving attention to high class plumbing brass goods, attention was soon turned to this division. According to General Manager Fischer, the Glauber interests are credited with being the originators of the present high standards of these goods. Quality first has been paramount in the quarter of a century this plant has been operating.

Of particular interest to readers of THE METAL INDUSTRY must be the layout, equipment and production of the foundry branch of the Glauber plant. The foundry proper covers a space 200 feet by 100 feet. Ventilation is a feature of this department, ventilators being eighty feet from the ground. The melting room is in a separate building from the foundry proper, thus eliminating any evil effects from gases to the foundry men. The workers in the melting room are similarly protected, two powerful forty-eight inch fans sucking out all the gas from the melting room.

There are twenty-five molding machines, each equipped with compressed air. All melting is done by natural gas and air. This fuel is used in Fisher furnaces. Tensile strength of castings made by this process develop 33,000 pounds to the square inch. Machinery has been installed in recent years which will reclaim all waste material and smeltings, not unlike the machinery used in mining.

The melt of this foundry is about 67 tons daily, which produces in one year something like five million separate castings. Close to 400 men are employed all the year

around in the plant, 100 of these devoting all their attention to the foundry branch of the business.

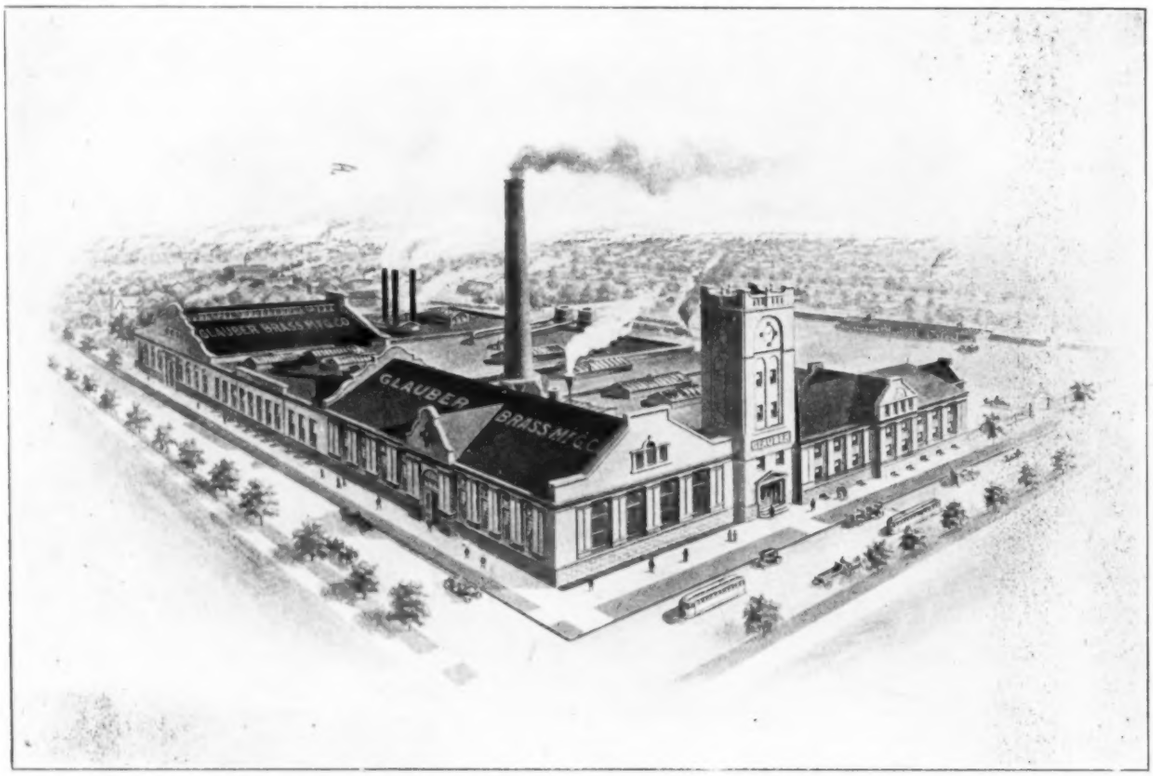
Other firms which have large plants in Cleveland, in which the delegates to the convention will be interested are:

The King Bronze & Aluminum Foundry Company, the Interstate Foundry Company, the General Bronze Foundry Company, the Acme Foundry Company, the City Brass Foundry Company, the West Steel Casting Company, the Standard Brass Foundry Company, the Forest City Foundry and Manufacturing Company, the Ideal Bronze Company, the International Foundry Company, the George Horvath Patten Brass Foundry, the Cleveland White Metal Company, the Allyne Brass Foundry Company, the City Brass Foundry Company, the Wellman Bronze Company, the Standard Brass Foundry Company, the National Bronze and Aluminum Foundry Company.

tracted for space, and, according to Secretary A. O. Backert, many more will be added before the entries close. Already it is apparent that the space in the main hall will not accommodate all the exhibits, and a temporary structure on a plot adjoining the Coliseum is now being erected. This structure will be connected with the main building, and visitors will not be required to descend to the street in passing from one to the other.

Large operating machinery, probably melting furnaces and similar appurtenances, requiring heavy foundations, will be installed in this building. In fact, from present indications, this temporary building will take on the appearance of a foundry itself, with molds in actual operation. Most significant in this move is the fact that although many large expositions have been held in Wigmore Coliseum, this is the first exposition to overflow its confines, and to require another building.

Hotel Statler, the Mecca for all large conventions that



VIEW OF THE GLAUBER BRASS MANUFACTURING COMPANY'S PLANT AT CLEVELAND, OHIO.

CONVENTION ARRANGEMENTS.

These are only a few of the many reasons why Cleveland, as the convention city for the eleventh annual gathering of the American Institute of Metals and the American Foundrymen's Association has been selected.

Although elaborate entertainment of the delegates has been provided, and much will be seen by them while here, the time might be said to be entirely too short, from September 11 to 16, to see all that Cleveland has to offer to these interests. By far the most interesting of the sights will be the mammoth exposition of foundry equipment, machine tools, accessories and the like, which will be on exhibition at Wigmore Coliseum.

When plans were first formulated for this exposition, it was deemed probably that perhaps 100 separate exhibitors would take space in this hall. Today, with the list still uncompleted, more than 120 exhibitors have contracted for space, and, according to Secretary A. O. Backert, many more will be added before the entries close. Already it is apparent that the space in the main hall will not accommodate all the exhibits, and a temporary structure on a plot adjoining the Coliseum is now being erected. This structure will be connected with the main building, and visitors will not be required to descend to the street in passing from one to the other.

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Hotel Statler, the Mecca for all large conventions that hold forth in Cleveland, will be the headquarters of the convention of the two big organizations.

Here the real business of the convention will be transacted, and the programme is in keeping with every other detail that has been worked out by the enterprising officers and committees.

Without proper entertainment of the members the convention would be lacking in many essentials. Work of developing this entertainment has devolved upon the officers and many committees, which have perfected their plans so far at this time as to give the visitors a good idea of what is in store for them. Chairmen of the various committees responsible for working out the details of entertainment are:

Edward B. Whitlock, Interstate Foundry Company, general committee; Herbert Boggis, Taylor-Boggis Foundry Company, reception committee; S. W. Hubbard,

Rogers, Brown & Co., entertainment committee; J. S. Smith, Smith Facing & Supply Company, plant visitation committee; W. B. Greene, Palmer De Mooy Foundry Company, golf committee; Mrs. W. C. Sly, ladies' entertainment committee.

Among the big things in the entertainment of the members will be free tickets to all for the ball game between Cleveland and Detroit on September 12.

On Tuesday evening of Foundrymen's Week there will be a theatre party at Keith's Hippodrome; Wednesday afternoon will be given over to inspection of the Cleveland Furnace Company's plant; Wednesday evening will be spent at Euclid Beach Park. For this trip special cars will be provided for the visitors, and free access to all attractions has been provided by the committees. Thursday noon will mark the luncheon to the ladies at Hotel Statler. In the afternoon an automobile ride about the city has been provided. Thursday evening the annual banquet will be held also at Hotel Statler, at which Irving Bacheller, noted humorist, will be one of the speakers.

Thursday and Friday will be given over to visitations to the following plants:

The Ferro Machine and Foundry Company, the Allyne & Ryan Foundry Company, the Western Electric and Manufacturing Company. The exposition at the Coliseum and adjoining building will close Saturday night.

Officers of the American Foundrymen's Association are:

President, R. A. Bull, Commonwealth Steel Company, Granite City, Ill.; senior vice-president, J. P. Pero, Missouri Malleable Iron Company, East St. Louis, Ill.; secretary, A. O. Backert, Cleveland, Ohio.

Officers of the American Institute of Metals are: President, J. L. Jones, Pittsburgh, Pa., and secretary-treasurer, W. M. Corse, Buffalo, N. Y.

These officers and the following constitute the committee on exhibits:

H. S. Covey, Cleveland Pneumatic Tool Company, Cleveland, Ohio; Alfred E. Howell, Phillips and Buttorf Manufacturing Company, Nashville, Tenn.; S. T. Johnston, S. Obermayer Company, Chicago, Ill.; V. E. Minich, Sand Mixing Machine Company, New York City; Joseph T. Speer, Pittsburgh Valve, Foundry and Construction Company, Pittsburgh, Pa.

C. E. Hoyt, Lewis Institute Building, Chicago, is manager of the department of exhibits. A list of the exhibitors was published in the August issue of THE METAL INDUSTRY.

THE COLISEUM ON 13TH STREET, CLEVELAND, OHIO. THIS IS WHERE THE EXHIBITION WILL BE HELD.

Equally attractive to those attending the meetings of the American Institute of Metals will be the program prepared for those sessions. The program is tentative at this time, but the most important feature of it probably will be additions of more instructive addresses. Here are the papers and the noted men who will speak on these subjects:

"Reclamation of Metallics from the By-Products of Foundry and Manufacturing Plants," by A. F. Taggart, Hammond Laboratory, Yale University, New Haven, Conn.

"Method of Selling Non-Ferrous Scrap as Pursued by a Large Producer," by J. M. Bateman, Western Electric Company, Cleveland, O.

"The Result of Joint Work of Casting and Testing the 88-10-2 Alloy by Five Foundries, Report of the Use of Deoxidizers of Bronzes, and Report on the Aspects of Bronze Failures," by various experts affiliated with the U. S. Bureau of Standards.

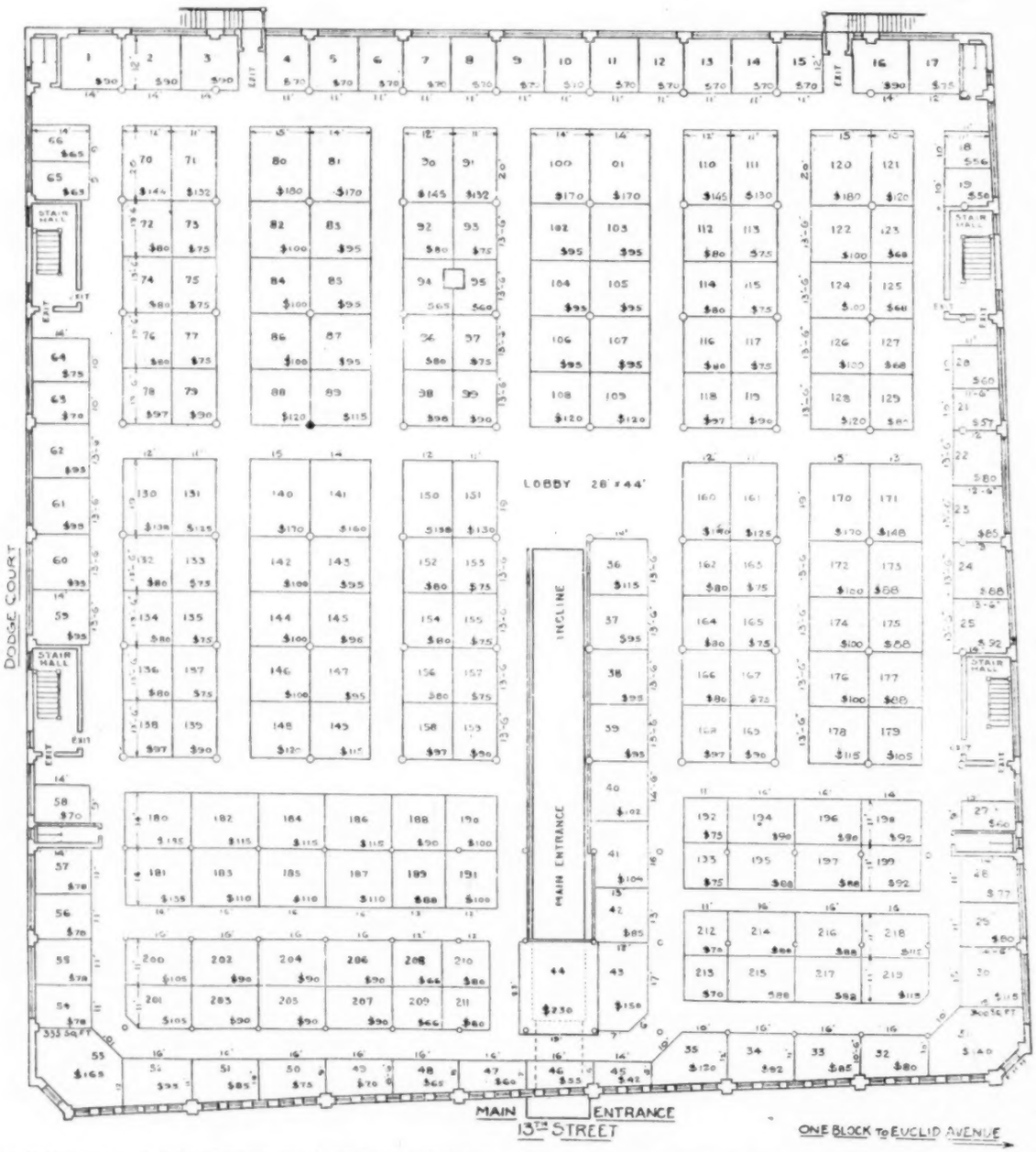
"Copper-Aluminum-Iron Alloys," by W. M. Corse, Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

"Tests on Rolled Brass Sheets Taken in the Direction of Rolling and at Right Angles to the Directions," by W. B. Price and P. H. Davidson, Scovill Manufacturing Company, Waterbury, Conn.

of the General Electric Company, Schenectady, N. Y.

"Aluminum Castings and Forgings," by P. E. McKinney, U. S. Navy Yard, Washington, D. C.

"Annealing Properties of Copper," by G. W. Ceaser and G. C. Gerner, Hammond Laboratory, Yale University, New Haven, Conn.



A PLAN VIEW OF THE EXHIBITION HALL IN THE COLISEUM AT CLEVELAND, OHIO. THE METAL INDUSTRY WILL BE FOUND IN SPACE 94.

"The Application of Oxy-Acetylene Welding Process in the Repair of Defective Non-Ferrous Castings, by S. W. Miller, Rochester Welding Company, Rochester, N. Y.

"Continuation of Discussion in Connection with Defective Bronze Castings in Use by the Board of Water Supply of New York City," by A. D. Flinn, Board of Water Supply, New York City.

"Evolution of Die Casting Process," by Chas. Pack, Doehler Die Casting Company, Brooklyn, N. Y.

"Disclosure of Blow Holes by Means of X-Ray Apparatus," to be reported by testing engineers employed in laboratory D

"Metallography as Applied to Non-Ferrous Metals" by W. W. Arthur, Frankford Arsenal, Frankford, Philadelphia.

"Heat Treatment of German Silver," by G. C. Holder, American Optical Company, Southbridge, Mass.

S. D. Sleeth, of the Westinghouse Air Brake Company, Wilmerding, Pr., and Mr. Barnes, of the Ft. Wayne Electric Company, Ft. Wayne, Ind., will present papers at the session to be devoted exclusively to the discussion of brass foundry practice, and papers also will be read by F. L. Antisell, Raritan Copper Works, Perth Amboy, N. J., and by C. T. Bragg, Ohio Brass Company, Mansfield, O.

THE CHEMIST AND THE BRASS-FOUNDER*

AN ENGLISH WRITER GIVES HIS VIEWS AS TO THE VALUE OF THE CHEMICAL CONTROL OF METAL PRODUCTION.

BY R. T. ROLFE, F.I.C.

In the following Paper the object is to show the necessity and the value of the chemist in brass-foundry practice if absolutely sure and safe lines are to be followed, otherwise the founder is groping in darkness. That may seem a very sweeping assertion, but in many respects it is correct.

ADMIRALTY GUNMETAL.

A case in point is a brass-foundry engaged in Admiralty work, and, consequently, chiefly in the casting of gunmetal. The Admiralty specification for gunmetal is: Copper 88 per cent., tin 10 per cent. and zinc 2 per cent. The Admiralty further requires that the metal of the casting shall have a tensile strength of not less than 14 tons per sq. in., with an elongation of not less than 7½ per cent. on a 2-in. test-piece. Assuming that the copper is melted in a crucible or air furnace, according to the quantity being dealt with, the tin and, lastly, the spelter are added, and the temperature raised somewhat and the metal poured. Without presuming to instruct anyone engaged in brass-founding how he shall cast gunmetal, it may be stated that, if and when he has carried out the correct procedure, still he can by no means be certain that the metal will fulfil Admiralty requirements—that is when working with brands of copper and tin of unknown composition.

Many founders find the greatest difficulty in conforming to the Admiralty specification. There is no need for the difficulty. I hope to demonstrate that success in casting depends first on the purity of the brands of metal employed, and only to a very secondary extent on the method of casting the metal—this is, of course, assuming that there is nothing wrong with the moulding. It is only by testing the brands of metal, and rejecting all those which are found to be unsuitable, that success may be attained, and a rejected casting will be, as with us, a thing unknown.

	A. Per Cent.	B. Per Cent.	C. Per Cent.
Antimony	0.24	4.08	6.78
Lead	0.35	3.15	2.66
Copper	traces	0.22	0.32
Iron	nil	nil	traces
Tin (by difference)	99.41	92.55	90.26
	100.00	100.00	100.00

First take the case of lead. Lead does not give one much trouble in gunmetal, because there is usually very little present. But the Admiralty specification stipulates that the proportion of lead present shall not exceed one-half per cent. Therefore one has to take steps to avoid it. It is quite easy to exceed that amount if the materials used are not known and checked. How does the lead get there? There is often a lot in the tin. Analyses are given in the table of three brands of tin that are on the market and used for the manufacture of gunmetal.

If either B or C is used, over one-quarter per cent. of lead would be automatically added. By using C, the finished casting would contain only about 9 per cent. of tin and nearly 1 per cent. of impurities.

There is also a little lead in the spelter, but as the proportion of the latter is so small, the amount of lead added in this way is almost negligible.

When making gunmetal entirely from new metal, it is thus quite easy to avoid exceeding one-half per cent. of lead; but entirely new metal is not generally used, as it is necessary to utilize a certain quantity of metal returned in the form of borings from the machine shops. There is probably also gunmetal mixed with a certain quantity of white metal, in the form of mixed borings. This mixed metal is melted down, analyzed, and finally mixed with the proper proportions of more copper and spelter to manufacture more gunmetal. There are a good many possibilities of mixing borings in even the best organized of machine shops, and it is no uncommon thing to find that a small quantity of some lead anti-friction alloy has got in somehow, and finally helps to swell the lead content of the gunmetal.

I do not suggest that there is likely to be any very marked difference between gunmetal containing 0.3 per cent. and that containing 0.5 per cent. of lead, but when one is working to specification it is necessary to know what is the degree of purity of the materials used. Incidentally, the presence of lead increases the liability to corrosion of the metal. Lead does not *alloy* with gunmetal, but, when the latter cools, separates out in the form of minute globules distributed through the mass, and being a weak metal, reduces the tensile strength and also the elongation. This weakening is very marked when the lead exceeds about 2 per cent. In some cases, however, where special strength is not required, large quantities of lead, up to 5 or 10 per cent. are added, with the production of a metal much more easily machined or filed. Such an alloy, if one may so describe it, is known as a "free-machining" alloy.

The main point to be demonstrated in connection with gunmetal is that, no matter how closely the specification is adhered to, one cannot be sure of getting metal of a good quality except under certain conditions. If not knowing those conditions, any founder has not experienced trouble with Admiralty gunmetal, he is more lucky than he deserves to be. The chief condition for obtaining gunmetal of sound structure is that the brand of copper employed shall be of a certain degree of purity. This point must now be considered, and for this it is necessary to consider what happens when gunmetal cools from the molten state.

Probably most founders understand the term "solid solution." Just in the same way as salt can be dissolved in water and a solution of salt obtained, so one metal can be dissolved in a molten mass of another metal and a solution of the one in the other obtained; and just as a salt solution can be frozen by lowering the temperature sufficiently, and a solid solution of salt in water obtained, so can the second metal be made to solidify and still contain the first in solid solution; and by that it is to be understood that the interspaces between the particles of the second are more or less filled up by the first, depending upon the amount dissolved.

Solid solutions of one metal in another are as a rule soft, strong and ductile, and accordingly are in general desirable constituents of the structure of any metal, if it is considered from the point of view of tensile strength. On the other hand, chemical compounds of one metal with another, like the compounds between metals and non-metals, are in general hard, weak and brittle. They are therefore undesirable constituents, again considered from the point of view of tensile strength. As mentioned, lead in gunmetal exists neither in solid solution nor as a

*Read before the London branch of the British Foundrymen's Association.

chemical compound, but as a free metal distributed in small globules throughout the mass. Being a metal of low tensile strength, it naturally weakens the structure.

When gunmetal cools from a molten state, the first constituent that falls out of solution is a solid solution of copper containing all the zinc, together with some of the tin, and it solidifies at 1,000 deg. C. Because it comes out of solution first, it is called the α-constituent, or first constituent. That body, quite a strong and valuable constituent, freezes, and the interstices, or the holes in the solidified network running all through the mass, are then filled by a second constituent, another solution of copper containing all the rest of the tin, and this second or β-constituent solidifies at 790 deg. C. The solid mass now consists of two solid solutions, the second of which, however, is not stable, but decomposes when the metal has cooled down to 500 deg. C., to form two more constituents, one of copper containing tin in solid solution, and the other of a totally different nature, a chemical compound, stannide of copper, corresponding to the chemical formula $SuCu_4$. That stannide of copper is often called the eutectic, from the Greek meaning "well-melting," because it is the most readily fusible portion of the metal. It is also called the δ-constituent. Thus the β-constituent splits up into two, one of which is a solid solution, much resembling the first or α-constituent, and often called secondary α, and the other the eutectic, stannide of copper.

b *c*

FIG. 1.—COMPARISON OF ADMIRALTY GUNMETAL MADE FROM DIFFERENT BRANDS OF COPPER.

(*a*) Brand 1.—Very good structure.
(*b*) Brand 2.—Good structure.
(*c*) Brand 3.—Very weak structure, showing contraction cavities in eutectic.

The following table shows the changes taking place in the cooling:

Above 1000° C.	Between 1,000 and 790.	Between 790 and 500.	At 500° C.	Below 500° C.
Molten Gunmetal.	α-constituent solid. β-constituent liquid.	α-constituent solid. β-constituent solid.	α-constituent solid. Secondary α-constituent liquid, but soon solidifying. δ-constituent liquid but soon solidifying.	all solid.

It must now be understood that very different distributions of the constituents are possible with the same composition of the metal—*i.e.*, 88 per cent. copper, 10 per cent. tin and 2 per cent. zinc. If more tin is in solid solution, there is less present as stannide of tin and the metal will be stronger. In a good gunmetal the eutectic areas should consist of very small isolated patches distributed through the ground mass (see *a*, Fig. 1). If, however, the eutectic areas are large and connected up to each other, the metal is much weaker. It is possible to tell roughly what will be the tensile strength of the metal by examining the micro-structure. There is another point about the eutectic that is very important, and that is that as it solidifies it contracts and leaves small cavities. It is through those cavities that water leaks when a casting fails under the water test. Such a structure is shown in *c*, Fig. 1.

The importance of all this to the foundryman is that with certain brands of copper it is impossible to obtain a good structure, and with certain other brands it is equally impossible to obtain a bad structure, with normal conditions of casting. From experience with seven different brands of copper, I find that the purer the copper, the better is the structure, and the stronger the metal will be. Electrolytic copper apparently gives the best results in the manufacture of gunmetal. If the brand of copper contains about one-quarter per cent. of arsenic, the results will still be very good, but not so good as in the case of electrolytic copper. With other brands of copper containing a high proportion of arsenic, 0.75 per cent. or over, very poor results are obtained. It does not matter what brand of tin is used, and the structure does not appear to depend upon the tin. Certain brands of copper have been found by us to be incapable of giving sufficiently good results for Admiralty purposes and have been rejected for that work.

The following table gives the average results of gunmetal cast from three different brands of copper, with also the average proportion of arsenic in each respectively:—

	Copper	Gunmetal Cast from Same			
Brand.	Percentage of arsenic	Mean of	Average yield point. Tons per sq. in.	Average ultimate breaking strain. Tons per sq. in.	Average elongation. Per cent.
1.....	traces	114 samples	11.2	16.6	14.3
2.....	0.30	172 samples	10.7	15.5	12.4
3.....	0.75	10 samples	11.2	14.4	7.4

Fig. 1 shows the structure of the metals made, while a typical analysis of a sample of each brand of the copper is as fillows:—

	Brand 1. Per cent.	Brand 2. Per cent.	Brand 3. Per cent.
Copper	99.83	99.49	99.04
Arsenic	traces	0.30	0.84
Tin	nil	nil	0.02
Lead	nil	nil	nil
Silver	nil	nil	nil
Iron	traces	traces	traces
Aluminum	traces	nil	nil
Oxygen, etc.	0.17	0.21	0.10
	100.00	100.00	100.00

Arsenic is, of course, a deoxidizer in copper, as is well shown by the analysis of brand 3, but its presence in abnormal quantity seems to cause the separation of very large quantities of eutectic, leading to the production of a very poor gunmetal. My opinion is, that although most of it goes off in the melt, the amount that is left seems to have some directive action upon the distribution of the tin, causing the separation of more eutectic.

(To be continued.)

THE MELTING OF PLATINUM

A Description of Present American Methods of Melting and Welding Platinum, the Equipment Used, the Technique and Cost of Operation, and the Difficulties Encountered.

Written for The Metal Industry By C. M. Hoke, A.B., B.S., A.M., Consulting Chemist, Jewelers' Technical Advice Company, New York.

IN II PARTS. PART I.

Although platinum has not been in general use long, the methods of melting it have already been worked out so well that now it is considered as easy to melt platinum as to melt gold, and soon it will be as common.

We shall describe here the melting of a small amount of metal, 100 pennyweight, which is the size melt most frequently made. A very common method of working, such as is carried on daily in hundreds of jewelry factories and refineries, will be followed. Other methods will be described later.

USING THE OXYGEN BLOWPIPE FOR MELTING PLATINUM.

EQUIPMENT

The fuel is ordinary illuminating gas, which is the cheapest and at the same time the most convenient fuel we have. An ordinary half-inch supply pipe, with a ⅜-in. service cock, will furnish enough gas for the largest melts, 75 ounces and over. Oxygen under pressure is used with it; either high or low pressure, but high pressure is the cheaper and involves less handling of tanks. The blowpipe is neither heavy nor complex. For this size melt the crucible used is almost always a sand crucible costing five or ten cents, and broken down on one side, as shown in the small cut. Often the crucible is set into another larger crucible, or into a pit gouged out of a piece of magnesite, fire brick, or some such insulator, to save heat.

Sometimes, particularly when fine platinum filings are being melted, little particles of the precious metal will hop out of the crucible; for that reason the screen is placed around it, and after working is carefully swept. Under the screen a piece of asbestos board protects the table. The rest of the equipment is shown in the sketch; hammer and anvil, dark blue spectacles, tubings, oxygen tank and oxygen regulator.

MAKING THE MELT

Suppose that the 100 pennyweights of platinum that we wish to melt is in the form of clean clippings or scrap; we should proceed about as follows:

First the clippings are stacked up against the high side of the crucible, as in the sketch; not left in a bunch at the bottom. No flux whatever is used. The blowpipe is connected to the gas supply and the oxygen regulator. If the gas is turned on all the way and lighted, a flame about three feet long will appear; this however is too large for a melt of this size, a gas flame 18 inches long is sufficient. Then the oxygen is turned on, and the flame shrinks and shortens to about 6 inches, and turns blue, at the same time becoming quite noisy.

The workman usually gets the proper flame at his second or third attempt, or at his first if he has already seen someone at work. It is not necessary to get a perfectly "neutral" flame, as in the case of oxy-acetylene. The metal begins to melt within a few seconds after the flame touches it. The torch is held at the angle shown, so as to keep the bottom of the crucible hot, with the nozzle about ¾ inch from the metal. The platinum slowly melts and runs down into a globule. As the flame is moved about over it, it runs around in the crucible like mercury. As soon as the worker is sure that it is thoroughly molten, without any solid lumps included in it, he removes his flame and lets the metal solidify. Then with a wet pliers, tongs, or other tool, he pushes the button out of the crucible and places it bottom up on some flat surface, such as a piece of fire brick, the bottom of an inverted crucible, or the like. He will find that while the top surface of the button as it hardened is quite smooth and shining, the bottom surface (now the top) is pitted and grooved, because of the irregularities in the crucible, and the pits are full of melted sand. Accordingly he quickly turns his flame on this pitted surface, for a few seconds, just long enough for the metal to melt and run smooth, while the beads of sand run to the edges. This is called *sweating*.

Quickly he turns off his oxygen, then his gas, and lays aside the torch. Then, while the button is still white hot, he will hammer it hard on the anvil, shaping it into a square block, plate, or bar, as he desires. The hammering does more than mere shaping, however; it proves the quality of the metal, for one thing, for if it is impure it will split under the hammer. Also, it makes the metal dense and hard, distinctly denser than if unhammered, so that it keeps its polish well when made up into jewelry. Often small beads of sand have stuck to the button, and these are knocked off by the hammer.

The hammering sometimes leaves grooves or dents in

the metal, which will not flatten out under the rolls. These also are quickly removed by sweating the surface as before, for a few seconds, and hammering again.

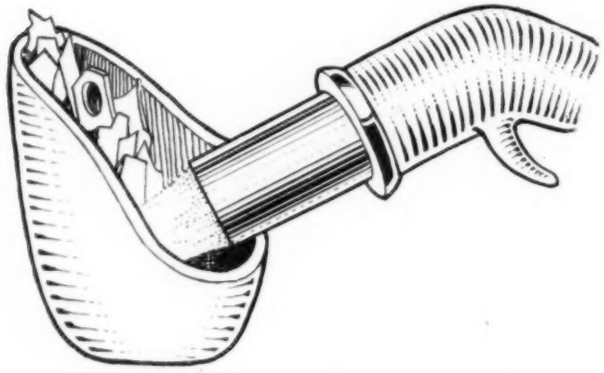
Many shops place the hot button under a drop hammer in a die, and so secure the densest and firmest texture of metal with least muscular effort.

Finally the button is cooled in water and rolled or drawn to the thickness required. It is advisable to roll hard, and little or no annealing is necessary.

Starting with 100 pennyweight of clean clippings, a man should finish the entire process of melting, sweating, hammering and sweating again, in about five minutes. With dirty metal, and with filings, the task takes a little longer, as will be described later.

REGULATOR

A word must be said of the importance of the oxygen regulator, which is seen at the top of the oxygen tank. It consists of three parts: a large gauge, for showing how much oxygen is in the tank, a regulating device for regulating the *delivery* pressure of the oxygen, and a small dial which shows what this pressure is. The needle valve is for turning oxygen on and off. For average size melts the delivery pressure would be set at about 5 or 10



A CLOSE UP VIEW OF THE MELTING OPERATION.

pounds; for large melts of 75 or 100 ounces, it might go up to 20 pounds or more. (With different makes of regulators, delivering different *volumes* of oxygen at the same pressure, these figures would differ.) Once the pressure is set at the desired point, it will stay so from the time the tank is opened till it is almost empty.

The advantages of the regulator are plain to be seen. It makes it easy to get the proper flame with little or no trial—the oxygen is delivered at the correct pressure, the needle valve is turned on full, and the flame is right. If a man uses too little oxygen, his flame is not hot enough to melt the metal, and the sooty flame may contaminate the platinum. If he uses too much oxygen, he will, of course, waste it, and at the same time perhaps make his metal brittle by letting it absorb oxygen. Also he will cool the flame, so that it will melt slowly. Finally, if he uses a great deal too much oxygen, he will blow out his flame, sometimes with a loud report, which means no danger to him but is unpleasant to hear. Also, unless he quickly turns off both oxygen and gas after such a blowout, he is apt to injure the inside of the torch. With an oxygen regulator properly set these things will not happen.

OTHER METHODS

So far we have described one method, as applied to a fairly small amount of metal. Almost every detail of this may be altered, (so long as the required temperature of more than 3,200 degs. F. is obtained,) by means of different fuels, different crucibles, and so on.

LARGE MELTS

When melts of 40 ounces or over are to be made, a lime crucible is commonly employed, as it holds heat better than sand does. It is cut from a block of fresh unslaked lime, wrapped with wire to prevent splitting. The hollow is made square or oblong, of the proper size, so that it will be easy to forge the button after melting. For melts of over 100 ounces it is well to use two torches at once, and the metal is fed in a little at a time from ladles previously filled and set close at hand. Such melts are rare, as platinum is usually sold and handled in much smaller pieces.

A lime crucible may be used but once, and is some trouble to make. A sand crucible may be used often, ten times or more if the metal is always clean. For these reasons sand crucibles are the more popular, except for very large melts.

SMALL MELTS

Both large and small melts are made in much the same way as the medium sized melt described in full, the differences being in size of flame and length of operation. But for manufacturers who expect never to make any large melts there are smaller torches provided. These are similar in construction to the torch pictured. Some of these small torches can be used successfully for welding such articles as rings, bracelets, etc., by turning on only a small needle-like flame.

OTHER FUELS

For a long time platinum was melted by means of *hydrogen* in conjunction with oxygen, both under pressure; in some parts of the country this is still done. Then it was found that illuminating gas, *compressed* in tanks, would give exactly the effect that *hydrogen* gave; it usually was sold at about the same price. Finally a torch was developed that would utilize ordinary city gas (at its ordinary pressure, which is less than a pound) in connection with high-pressure oxygen. This has great advantages over either *hydrogen* or *compressed* illuminating gas; it is much cheaper, it reduces the number of tanks to be handled to less than half, there is less danger of leaks, and, in some instances, it lowers insurance rates, so that now it is the approved fuel. Acetylene has been used a little, but as it is much more expensive than ordinary gas and more difficult to manage, it has not cut much figure in the platinum field. Natural gas may also be employed with the torch in the illustration.

In a few cases electricity has been used to melt small lots of platinum. The temperature of the electric furnace is very high, but so far its application to platinum has not been conspicuously successful, in many cases because the carbon electrodes have contaminated the metal by forming a carbide. It is quite possible that this method will become most useful, but at present it does not compete.

COST

The cost of operation depends upon three main factors; cost of oxygen and gas; quantity of metal handled at a melt; the skill of the operator. It is plain that the larger the melt the less the expense per ounce.

With illuminating gas at 8 cents per 100 feet, it will be seen that it is a very small factor in the cost; from 10 per cent. to 50 per cent. more gas is used than oxygen. In large cities oxygen costs about $2 per 100 feet, the price running up to $12 in more out of the way places.

Here are some figures from the routine work of a large Newark factory: 4,621 pennyweight of platinum

melted, and 3,032 pennyweight annealed, with one 100-ft. tank of oxygen, the metal being handled in lots averaging 600 pennyweight each. A melt of 640 pennyweight was made in three minutes by the watch. 1,030 pennyweight was melted in one melt by 11 feet of oxygen.

The expense runs for the average manufacturer, who makes his melts in lots of less than 100 pennyweight each, from one to seven cents an ounce, depending largely upon the skill of the worker. But for the larger factory, as in the case of the Newark plant just described, the cost runs down to about 4/10 of a cent an ounce.

(In the second of this series the following will be discussed: Welding Platinum; melting platinum filings; the handling of impure metal; the causes and cures of such difficulties as "double," brittle, and pitted platinum, etc.)

(To be continued.)

REGULATING THE OUTPUT OF A BRASS MANUFACTURING PLANT

How a Western Factory Solved Its Production Problems.

By P. W. Blair.*

A Detroit brass manufacturing plant, making a general line of brass goods was experiencing trouble keeping other production in joint with their orders or shipping requirements. The factory was growing rapidly owing to the heavy orders they had received for brass parts and accessories for the automobile trade. Each week they found it difficult to master details or fill orders complete.

This or that article would run out of stock suddenly and pending a rush order or the execution of same other shipments had to be held up. Naturally a succession of broken promises and of failures to meet orders promptly did not have a favorable affect upon the trade. Every now and then a good customer would lose patience and withdraw his patronage and cancel his order. The number of rush orders became so large as to disorganize the shop for regular production. Hardly a stock order was able to pursue its way without interruption.

Eventually production would be completed on the majority of these, but always the sidetracking of an order meant a congestion of the floor space, which further handicapped operations. Then all too frequently parts thus sidetracked at some point would fail to resume their journey. When these were needed for assembling frequently they could not be located. In this case the only course was another rush order to the foundry for more castings. And so it went on from fair to bad and from bad to worse and in proportion as the confusion increased profits dwindled in spite of mounting and increased sales.

Finally, the superintendent decided to call in a production expert for consultation. He immediately saw what was needed, and this badly, was a little system. The business had grown too large for one man to effectively control without some red tape, no matter how familiar with the details nor how able he might be. So he set about a simple production scheme by means of which the superintendent could retain his grip on the entire factory.

Several forms were required and the introduction of an upkeep stock department.

The forms introduced were a new manufacturing order, an identification ticket to accompany work through the factory, starting from the foundry and departmental delivery records to check the delivery of parts forward from one department to the next. The main form, however, was a record of production and shipments.

A perpetual inventory can thus be maintained not only on finished stock on hand, but on production in each stage. The record is kept in the superintendent's office under the control of the upkeep stock. Although at first he opposed it he finally came to take the keenest delight in it after he saw the results, for it gave him, to use his own expression, "a perfect picture of the travel and location of every order and with it he feels like the engineer with his hand on the throttle."

Thus by means of this record an inventory is had of the entire production of the plant. A glance shows not only the balance on hand of finished stock but the quantity, if any, in course of manufacture at each important stage. This form is a ten by seventeen and a quarter inch ruled sheet, identical on both sides, with the exception of the topmost column headings. The column headings on one side are from January to June and on the other from July to December. Thus a single sheet answers for a whole year for one catalogue number. There is a sheet for each size manufactured and these are kept in a spring-back binder, classified according to articles. For instance, all the globe valves are together, all oil cups and lubricators in separate divisions.

Tabs or indexes on each initial sheet in each class enable almost instantaneous location of any pattern number. The first column on the form is for the manufacturing order number, the second for the date this order is issued, the third for the date the initial foundry order is completed, which means it is started through the factory. The fourth when all machine operations have been performed and cleared to assembling department.

By this method an inventory is had of the entire stock of goods in the factory in course of construction and of the entire production. A glance shows not only the balance on hand of finished stock but the quantity, if any, in course of manufacture at each important stage. Maximum and minimum limits are set and as soon as the balance on hand reaches a minimum, if shipping orders are continuing to come in at the regular rate, a new manufacturing order is issued.

By adding up at the end of the month the shipping column the total sales for the month are obtained or shipments made. This total must agree with the shipping-room records. By subtracting this total from the balance on hand at the end of the month plus pieces delivered to finished stock that month, if any, the balance on hand to carry forward is obtained. This should agree with the final figure in the balance on hand column.

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TO STRIP PLATINUM FROM GOLD.

A method that is being successfully used for removing platinum from gold is as follows: Prepare a solution of aqua regia by mixing three parts of pure hydrochloric acid and 1 part of pure nitric acid. Avoid an addition of water.

Immerse the articles containing the platinum in the cold aqua regia solution, and let them remain there until all the platinum is dissolved. The solution should never be used at a higher temperature than 60 to 70 degrees; otherwise the gold is liable to be attacked.

It might be possible to strip the platinum off by electrolysis by using the aqua regia solution and a reversed current. The articles, in such an event, would be the positive or anode and strips of carbon could be used as the negative or cathodes. One or two dry cells might answer the purpose.—C. H. P.

DETERMINING WEIGHT OF DEPOSIT*

Some Valuable Suggestions for the Chemical Determination of Electrolytically Deposited Metal

By L. C. Wilson.

(Continued from March.)

GOLD.

The other way of estimating gold really depends on reducing it to the metallic state from its solutions, collecting the precipitate and weighing it. Various solutions are available for this purpose, ferrous sulphate, otherwise known as copperas, oxalic acid, formaldehyde, hydrogen peroxide, and so on, but it will suffice to consider only one or two of these.

Fifty cubic centimeters or so of the cyanide solution to be tested are measured into a beaker or evaporating dish and a decided excess of strong hydrochloric acid added. The fumes which are given off are extremely dangerous, so care must be taken not to inhale them. A precipitate appears and the solution is boiled until this is dissolved, then 75-100 c.c. distilled water are added and the liquid warmed after which a large excess of a clear solution of ferrous sulphate is poured in, a cover placed over the beaker or dish and the whole warmed for several hours on a water bath or hot plate; under these conditions the gold is precipitated out as a fine powder. This is filtered off, washed thoroughly with water containing a little hydrochloric acid, to remove the iron, then with pure water and the precipitate and filter dried.

A porcelain crucible is next wiped clean, then heated to redness in the flame of a Bunsen burner or blast lamp, cooled and weighed. For safety's sake it would be well to heat the crucible again and weigh, to see if there is any change in the weight; if so, the process should be repeated until there is no further change.

The precipitate should be transferred as completely as may be to the crucible, the filter burned by rolling it into a little bundle and wrapping a piece of platinum wire around it then touching with the gas flame, catching the ashes on a clean piece of glass and later on brushing them into the crucible, or it may be folded and placed in the crucible, which should then be gently heated until the paper is consumed. The whole should be heated until all organic matter is burned off. After it has cooled off, always under a beaker or in a dessicator, it should be weighed; the difference between this and the last weight represents the amount of pure gold present in the quality of solution taken for analysis.

As noted above, oxalic acid may be used instead of ferrous sulphate. In this case the preliminary operations of acidifying with strong hydrochloric acid and boiling until the precipitate is dissolved, is the same as before. Water is then added and a solution of oxalic acid, or ammonium oxalate with a small amount of sulphuric acid, poured in. The beaker or dish should be covered and put in a warm place for a couple of days, after which the precipitated gold may be filtered off, washed with hydrochloric acid, then with water, the filter burned off and the crucible weighed.

Another method which requires perhaps less labor is based on the reduction of litharge, one of the oxides of lead, to metallic lead by potassium cyanide, the easy decomposition of gold cyanide by heat and the tendency of gold and lead to form an alloy under such circumstances, the gold then admitting of separation without difficulty. In practice, a quantity of the plating or other solution is evaporated to a syrupy consistency in a porcelain crucible or dish, then a few grams of litharge thoroughly stirred in and the evaporation continued to dryness. The temperature is raised then to a fairly high degree and maintained for a time, when the gold and lead collect in the bottom of the crucible in the form of a button. The mixture may then be allowed to cool in the crucible and the latter broken, or it can be poured into a conical shaped mold, such as is used in assaying. In either case the adhering impurities are removed from the button by pounding and brushing, then it is placed in a flask with a few cubic centimeters of moderately strong nitric acid and boiled until the lead is all in solution. The gold is left behind and may be collected by filtration, ignited and weighed as before.

On a larger scale this procedure affords a means of recovering the gold from various wastes. The metal recovered in this way, or from other determinations, may be dissolved in aqua regia, forming gold tri-chloride, and used for replenishing the baths. For working up wastes, however, the reduction with ferrous sulphate solution is perhaps preferable, considering everything, and it may be carried out substantially as outlined above; when a large volume of liquid is to be treated it will be advisable to concentrate it to a convenient bulk by evaporation, before adding the acid. Of course, there will be no need of taking a certain definite quantity of liquid in this case since the gold is to be recovered, rather than estimated quantitatively.

A still simpler means of recovering the metal in an old bath is to add zinc dust, or the very finely granulated material, and set aside for a few days. The zinc and the gold change places, the latter appearing in metallic form while the zinc goes in solution. Naturally, there should be an excess of zinc present to insure complete removal of the precious metal; when the action is over, the supernatant liquid is decanted off and the precipitate washed and treated with dilute nitric acid to get rid of any undissolved zinc or other metals, copper and so on, which might have been present and become reduced along with the gold. After thorough washing, the pure metal which is left may be dissolved in aqua regia, as before, or ignited and collected in metallic form.

Gold is plated almost exclusively for decorative purposes and the deposit will vary from a mere flash or wash to a reasonably heavy coating, depending on the requirements. In determining the weight of metal deposited, therefore, it may be necessary to take a sample of larger area in some cases than in others, in order that the final quantity of gold obtained for weighing may not be too small; as a general proposition, the smaller the sample worked on, the greater are the chances for error and loss and the results will be correspondingly less accurate.

As a ready means of determining the amount of gold on a part, with a degree of accuracy which is often sufficient for the purpose in hand, a small-sized sample is cleaned, the plated area carefully calculated, then immersed in strong, not necessarily concentrated,

*Descriptions and illustrations of the apparatus needed to carry out the analysis described in this article are contained in an article by the same author, published in May, August and December, 1914.

nitric acid, whereby the base metal is dissolved away leaving the gold, which is not attacked, free to collect in the bottom of the flask or beaker. The sample need not be entirely taken into solution, but may be removed from the acid as soon as it is apparent that all of the gold has been loosened and fallen off; in taking the part out of the liquid care must be exercised to see that no spangles of gold cling to it or the tongs and thus be lost. The solution may be diluted with water, and perhaps some of the acid neutralized with ammonia so that it will not attack the filter paper so vigorously, then filtered and the precipitated gold washed well with water to remove all traces of other metals and finally ignited and weighed. Dividing the weight of gold found by the area of the plated part in square inches and moving the decimal point three places to the right will express the results as milligrams of gold per square inch. If for convenience or any other reason it is desired to express the result as so many pennyweights, which is a common way of putting it, it can be easily done, remembering that one pennyweight = 1.555 grams.

The above procedure is also useful in testing samples qualitatively to determine if they have been plated with gold at all, the appearance of the gold flakes floating in the liquid being evidence that they have.

In the case of very heavy deposits, which are of course thicker and denser, it will require a much longer time for the nitric acid to attack the base metal sufficiently; in fact, there may be practically no action at all for some time, since the acid has to penetrate through the pores of the gold deposit before it can dissolve any of the base and release the gold. In such a case the procedure given below may be employed.

The plated part is cleaned, the area carefully determined, then it is immersed in warm aqua regia, heating gently if need be, which will soon remove the gold by taking it into solution, at the same time attacking to a greater or less extent the metal of the part itself, depending somewhat on the composition of this. When the plate has been removed completely the part is taken out of the solution and well rinsed, allowing the wash water to flow back into the acid liquid.

Perhaps the easiest way of getting out the gold from this is by precipitation with ferrous sulphate or oxalic acid, as shown above. When using either of these, however, it is essential that all nitric acid be entirely absent, consequently the solution must be evaporated to dryness, a few drops of strong hydrochloric acid added and the mass again evaporated to dryness; this should be repeated again, then a small amount of hydrochloric acid added, the whole diluted with distilled water then reduced with ferrous sulphate solution as before.

If it is considered more convenient or desirable to use the electrolytic instead of the reduction method, it will be necessary first to remove all metals which might be deposited along with the gold and thus give incorrect results. This may be done by precipitating the solution by ferrous sulphate, then washing well and dissolving in aqua regia, after which the solution may be diluted with distilled water and most of the free acid remaining neutralized by potassium or sodium carbonate or hydroxide. Sufficient potassium cyanide should then be added to precipitate all of the gold as the cyanide and re-dissolve it as the double cyanide. The electrolytic apparatus is then set up and the solution electrolyzed as before.

(To be continued.)

REFINING OF PLATINUM.

A reader of THE METAL INDUSTRY writes: Would like to have your advice on a matter pertaining to the refining of platinum as we are having some difficulty. The method we are using in handling gold, silver and platinum filings is as follows:

"First thoroughly clean, then give them a bath in chemically pure nitric acid to dissolve the silver, then give it a bath of nitric and muriatic (half and half), for dissolving the gold, then boil the remainder or platinum in cyanide to eat up the small particles of silver.

"We find, however, that some of the platinum is dissolved while working out the gold in the aqua regia before precipitating the gold. We have thrown this solution down with ammonium chloride which gives a yellow precipitate and which we have afterwards melted in the oxyhydrogen torch which gives a button of platinum but which is so very dense or hard that it is not malleable and we cannot work it. The information we would like to get is whether this yellow precipitate is iridium or any of the other alloys of platinum by which they harden the pure platinum and also why any of the platinum should dissolve in the bath of aqua regia."

A.—The method outlined above is correct. It is only to be expected that the aqua regia will dissolve the platinum, forming $PtCl_4$, as will other mixtures evolving chlorine, but not as readily however as will aqua regia dissolve gold. Platinum alloyed with gold is more soluble than the pure metallic platinum in aqua regia. If gold is fused to a platinum crucible it may be slowly dissolved under moderate heat, in dilute aqua regia without seriously affecting the platinum vessel. The yellow precipitate is the double chloride of ammonium and platinum. It must be carefully washed in alcohol, as in water this precipitate is slightly soluble; otherwise the wash water should be saved for further treatment if there is any quantity of it.

After washing and drying this yellow powder, it is usual to place it in a crucible and under moderately high temperature drive off the chlorine and sal ammoniac, leaving a greyish granular substance known as sponge platinum. This platinum sponge contains about 2 per cent. of iridium, which is used for increasing the resistance to abrasion and attack of chemicals.

Where a higher refinement is desired than is given by the above treatment, the platinum sponge should be dissolved in aqua regia and again precipitated with ammonium chloride. There will probably be some platinum left in the mother liquid after the first precipitation. This too should be recovered as the present high price of platinum will probably warrant it. Finally, if it is desired to melt the sponge platinum, use a lime support and avoid carbon or silicon contamination. The presence of ⅓ of an ounce of silicon per thousand ounces of platinum renders the melt hard and brittle.—H. D. C.

PICRIC ACID.

Picric acid is made by treating carbolic acid with nitric acid, the result, when dried, being yellow crystals that have a very bitter taste. Hence the name, derived from a Greek word, "pikros," meaning bitter. Some of the best known war explosives are picric acid compounds. The British "lyddite" is one of them. The French "melinite" and our own "dumnite" are also picric compounds.

BRONZE STATUARY AND ITS PRODUCTION IN ANCIENT AND MODERN TIMES

A Complete and Exhaustive Discription of the "Lost Wax" Molding Process.

By George Frederick.

The lack of bronze statuary and other classical refinements in our homes does not reflect favorably on modern taste, and in that respect we must admit that we have deteriorated as a nation. We naturally admit that we have a class living amongst us who foster art and good taste in all its branches; this trend is, however, more often inborn than acquired. What a delight to enter the home of such people—a refuge for the objects of neglected art. But, alas! there are, relatively speaking, but few such patrons of art! Indeed, those who possess this world's goods often delight rather in modern taste than in the classical, and the majority of those who are gifted with, or have acquired, better taste, unfortunately lack the means to beautify their homes in the way they would. However this may be, the ancient bronzes now extant—and more particularly, perhaps, those of mediaeval times—are nearly sufficient to go the round, so that unless matters improve there will be a danger that those who are conversant with and devoted to the bronze art and craft may lose their cunning.

Perhaps the only remedy the metal industry can advance for the betterment of this state of things is the reproduction of the beautiful classical examples, in the hope that their exposal for sale may awaken the latent taste in some of those who are looked upon as leaders of fashion. It is with this desire in view, and also in the hope of awakening the dormant artist and craftsman to new activity, that these lines were penned. To them such work must be a labor of love, as it is inconceivable that the sculptor and skilled bronze founder can share the lack of taste by which they are surrounded. In the following we give a short *résumé* of the processes which have in some cases been practiced for thousands of years, and which are still as effectual as they were in the days of the Pharaohs, and by which some of the masterpieces of the classical age were immortalized to serve us as patterns, and will do so for generation after generation yet to come.

There is no material so suitable as bronze or any other copper alloy in which to perpetuate a work of art. Stone, wood and china are perishable and fragile; ivory is not obtainable in pieces sufficiently large, and if it were, it also is fragile; more precious metals would do, but they are too expensive. With bronze there is no limitation as to size, and all parts can be executed in their relative and proper proportions without fear of breakage and without having to leave ugly stumps for support.

The most important part of the subject next to the sculptor's work is the mold; and it is not in our province to lecture to the artist, and as the method of compounding the alloy and the process of casting are well known to our readers, we will confine ourselves to the preparation of the molds in the hope of having something new to bring to some, and maybe to refresh the memory of others.

If we go rather fully into the details of these important methods we must point out that we have no intention of posing as experts in the fine art of sucking eggs, but we would rather remind the grandmothers that they are not the only generation of readers.

"A cire perdue" is the name by which the most ancient method of producing bronze statuary is known; the literal translation of the French word is "lost wax." There is, however, an older process of making molds—by carving them out of schist, but as this was only used for primitive bronze weapons and implements it does not interest us here, as we are dealing with a higher standard of art. This "cire perdue" process is the simplest and is exceedingly old, having been in use from the oldest antiquity until the fourteenth century, when it was revived, as we shall see, and is still in vogue to this day. In its oldest form it was only possible to cast solid objects, but means were soon found to cast hollow ornaments also.

The process is as follows: The object to be produced in bronze is, in the first instance, formed of wax; this model is then surrounded by a plastic loam, and an opening, generally at the base, is left. This loam mold, containing the wax model, is now slowly dried, and is then heated to a temperature at which the wax model melts and runs out of the opening which has been left. The wax, which has thus disappeared, leaves a cavity in the loam exactly in the negative form of the original model. The mold is now baked, after which it is ready to receive the liquid metal. The beauty of this process is that no "fins" are left such as show in all castings made in divided molds, and also that the finished product is an absolute duplicate of the artist's work. In order to cast hollow objects a core must be placed inside the wax model, and thus inside the hollow mold. This is done as follows: Instead of preparing a model of wax, one is made of loam, but just a little smaller than the finished object is to be. This loam model is in reality a core, which is now thoroughly dried and finally baked, during which process a slight shrinkage takes place. When cold the core is covered with a layer of wax the same thickness as the metal of the finished statue is to be. It is important that this layer of wax should be of uniform thickness, because the metal which eventually takes the place of the wax, if of unequal thickness, would cool slower where thicker, and quicker where thinner, and as the whole of the casting shrinks when cooling, it is important that this cooling should take place equally all over, as otherwise the finished object might be distorted or even fractured. When the core, with its finely-molded wax surface, is thus finished, the further procedure is the same as that for solid castings; but it should be mentioned that in order to preserve every detail of the model in its finished state it is well to cover the wax model first with a layer of the finest loam slurry, which might be applied with a brush if the form is intricate, so that the loam may enter the deepest recesses; it is then gently dried, after which the outer loam covering, which gives body and strength to the mold, is applied. After lightly drying the mold, as for solid castings, we must now make provision to hold the core in its place before we run the wax out, or else it would be quite loose; this is done by a number of pins or nails made of the same metal as that of which the final statue is to be cast, as they will form part of the finished object. It is advisable to provide a few channels for the escape of the air when the metal enters the mold, otherwise the wax is run out and the outer form baked as described before. If the loam mold is removed after the casting has cooled, the outer ends of the pins which held the core in place are filed off. An opening is either left, or subsequently made, if it is necessary or desirable to remove the loam core. With this "A cire perdue" method large statuary can be produced, all cast in one piece; but during the best periods of the classical age—say 600 B.C.—it was preferred to cast the several pieces—such as heads, legs, arms, torso—separately, and then fit them together. This was probably done in order not to lose the whole of the labor if a part should prove to be a failure.

In order to show how familiar the ancients were with this process it may be interesting to quote Theophilus, who says: "In order to obtain a suitable material for core and mold, take manure and mix it with well ground clay; let it dry in the sun, then grind again and carefully sieve, mix with water, and smooth or rub it down thoroughly." Concerning the wax he says: "See that the wax is of the same thickness everywhere." He also lays stress on the baking of the molds; in fact, his instructions are so correct and lucid that they may be followed today.

When large objects, such as baptismal fonts, bells, or church doors, are to be cast in bronze with high-relief or

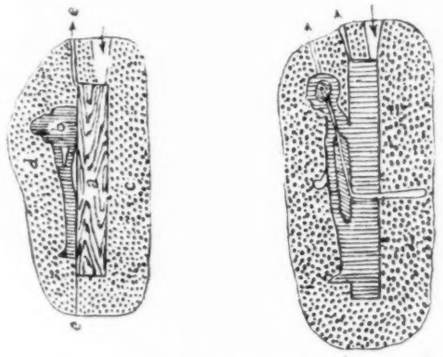

FIG. 1. MOULD FOR PART OF CHURCH DOOR PANEL.
FIG. 2. MOULD FOR CHURCH DOOR PANEL WITH HOLLOW FIGURES.

undercut figures and objects, the methods adopted are slightly different. A panel, for instance, for a church door might be cast from a mold partly prepared of wax and partly of wood (see Fig. 1, which represents a part of such a panel, the pattern being partly of wood), and in order that this wood might be removed bodily the mold should be in two parts, divided at *e*. The upper and lower halves of the mold are represented by *d* and *c*, while *b* is the representation of a tree in wax. The part *c* of the mold can be removed without difficulty in the usual way familiar to all foundrymen; by warming the board it will easily detach itself from the wax models set upon it. After the board has been thus removed the wax is run out; the two halves of the mold dried and united again are then ready for casting. The funnel for pouring in the metal and one of the air-holes are shown on the sketch. This method would answer where a solid casting is preferred; where, however, the larger bodies are to be hollow, the proceedings will be as indicated by sketch, Fig. 2; here the mold is entirely of wax, and a core for the body and head of the figure are shown as held in position by an iron rod.

The foregoing processes are descriptive of the production of bronze castings in the process in vogue up to the fourteenth century.

We will now investigate the further developments which, together with the earlier ones, are still in use to this day. The method of Benvenuto Cellini (1500-1571) is the next important step forward, and requires our close attention, because it is not easy to understand, or rather, it is difficult to explain. The following is a free translation of Cellini's own writing: "Model the statue you wish to cast in earth (clay), mixed with wool (from sheep shearing) which has been left to decompose. The model must be minutely finished with all details which are to be seen in the final bronze, and it should be overhauled when dry. In order to form a plaster mold from this model, the latter is covered with finest tinfoil in the following way: Melt wax and turpentine in equal parts, and apply this mixture with a bristle brush to the model, then carefully apply the finest tinfoil in suitable sized pieces to cover the whole statue, pressing it into all recesses. This is oiled all over, and the plaster-of-Paris mold can now be made. The preparation of the plaster mould can be accomplished in divers ways; the one I like best and generally adopt is as follows: If possible, make a number of molds of the different parts, such as legs, arms, head, etc.; the number will depend on the relative positions of the limbs to the torso. These molds of the separate parts must be most carefully prepared, and while the plaster is still soft stick a staple like a hairpin into each portion of the mold, so that a small loop projects to which a string can be tied; this plaster mold or series of molds should be of uniform thickness. When the plaster has set, remove one section after another of this compound mould carefully, to see whether they can be removed freely without injuring the model—it is best to take the part adjacent to the one first removed, and so on—and replace each before taking up the next. After all sections have been thus treated, put a little lump of clay to cover each of the wire loops, prior to a plaster mantle of 1½ in. to 2 in. thickness being applied to cover the compound mold and hold all its segments in place. Before this outer mantle is applied the inner sections must have been dried and oiled, so that the outer mantle will not adhere, but can be easily removed. The outer mantle, very probably, must also consist of several sections (at any rate at least two), which must be individually tested to see if they will remove, as with the inner mold. It will now be best to illustrate the foregoing by an example; but instead of a whole figure we will take a head only, being more easy to illustrate. It will be understood that the whole procedure here described is for the purpose of producing the wax model from which statuary can afterwards be cast, and it is obvious that the number of such models from these molds is unlimited if they are carefully handled. In Fig. 3 we see the model of a head which has been covered with tinfoil; the multiple inner molds, each with its wire loop or staple, are held in position by half the outer mantle. The thickness of the inner plaster form depends upon the size of the object. Each section is, naturally, made by itself, and when the first is finished and lifted off at right angles to the surface covered, the sides are trimmed with a knife, the section oiled and put back, when plaster is applied for the adjacent section, and so on, not forgetting, in each case, to press in the wire staples before the plaster has set. Each section is made as large as possible to lessen the labor, but it must cover only protuberances from which it can be lifted off freely, and there must be no covering of undercut parts. Completely undercut portions, such as a lock of hair, can either be modelled in the same form so that two sections meet half-way under such undercut portion and can be withdrawn to either side, or such portion can be ignored on the mold, being molded separately, and subsequently attached to the model when this is so far finished."

(To be continued.)

PRODUCTION OF SPELTER IN THE UNITED STATES, 1916.

By C. E. Siebenthal.*

Spelter statistics January 1—June 30, 1916:

Supply:	Short tons.
Stocks on hand January 1	14,253
Production from domestic ores	267,696
Production from foreign ores	48,756
Imports	464
	331,169

* United States Geological Survey.

DOMESTIC ALUMINUM INDUSTRY

SOME DETAILED INFORMATION REGARDING ALUMINUM CONDITIONS IN THE UNITED STATES.

The United States Geological Survey has issued a bulletin as a part of the Mineral Resources of the United States for 1915 treating on bauxite and aluminum. Some very interesting information is given in this bulletin, particularly relating to aluminum conditions in the United States. In a speech made in the early part of 1915 in Detroit, Mich., A. V. Davis, president of the Aluminum Company of America, Pittsburgh, Pa., stated:

That it is the desire and intention of the American producer to make enough metallic aluminum to supply the requirements of the United States, but that it is obviously difficult to maintain establishments large enough to supply domestic needs, while supplies from outside are cut off, and then during normal times, while imports are coming in, to store supplies or to close down plants altogether until another period comes on during which imports may again be cut off. There is only one cure for the present shortage in metallic aluminum, and that is to make more metal. This the American producer is preparing to do. A schedule has been planned that calls for the expenditure of $20,000,000 during 1915 and 1916.

To carry out a plan of such magnitude takes time, and Mr. Davis reported that it would probably be May, 1916, before results could be obtained from the first of the company's work and probably be December, 1916, before the work was finished.

Toward the end of 1915 the Aluminum Company of America was making nearly twice as much metal as in the same period in 1914, and when the new projects are in working order there will be so great an increase in production that the company will be able to supply the domestic demand even though no foreign metal is imported.

One of the most important developments of 1915 in the aluminum industry was the taking over of the property of the Southern Aluminum Company by the Aluminum Company of America. The Southern Aluminum Company, as reported in Mineral Sources for 1914, was forced to abandon work on its project at Whitney, N. C., on account of the war in Europe. The Aluminum Company of America now (May, 1916) has a large force of men on the ground pushing operations forward as rapidly as possible. It is expected that a production will be made from this plant late in 1916 or early in 1917. The present power house at Whitney is to be dismantled and will be replaced by another of later type on the west side of the river. Further plans are reported for a steel-reinforced concrete building to cover a considerable acreage.

The large rolling and stamping mill which the company is erecting on Hudson River at Edgewater, N. J., will be not only the largest mill owned by the Aluminum Company of America, but the largest mill of its kind in the world.

It is reported that the erection of dams for the company's project on Little Tennessee River, near the border line between North Carolina and Tennessee, will be begun in 1916, and already preparations are being made for a cement plant at Chilhowee, 6 miles from Alcoa, the company's headquarters in this part of Tennessee. A statement as to the projected developments in this region was given in Mineral Resources for 1913. These developments will be pushed as fast as the market will take the product.

The water-power project on St. Lawrence River is also being developed.

NEW ALUMINUM PLANT.

It is reported that the Mineral Products Corporation is to build a plant in Utah for the production of metallic aluminum from alumina produced in making potassium sulphate from alunite. Some research work is reported as having been done on this alumina to produce a refractory material capable of withstanding high temperatures —for example, 2,500° C.

THE ALUMINUM MARKET.

The aluminum market in 1915, like that for most of the metals, went through a series of very radical changes. According to Mr. Davis, president of the Aluminum Company of America, this company, the only American producer, had been stocking the metal for a long period prior to the revival of business in April, 1915. At that time it had the largest stock of metal in the history of the company and perhaps the largest stock of aluminum that the world has ever known. The consumption of the metal then began to increase materially, and the war, cutting off imports to a large degree, also became a factor in the scarcity which ensued. The company has a Canadian plant from which a substantial quantity has come into this country during recent years, but in 1915, as well as in 1916, imports from this source have been stopped, owing to an embargo placed by the English War Office on the exportation of aluminum from Canada. The effect of this embargo, as well as the difficulty in getting other foreign aluminum, is plainly indicated in the statistics of imports into the United States during 1915. The price per pound ranged approximately from 19 cents at the beginning of the year to nearly 60 cents at the end.

USES OF ALUMINUM.

The rapid increase in consumption of metallic aluminum shows that the metal is gaining in favor on account of several of its inherent qualities, among which are lightness, comparative toughness, durability and resistance to chemical corrosion. The fact that aluminum has been successfully soldered and welded enables it to take its place among the most useful of the metals. The outlook for metallic aluminum in the future is exceedingly bright.

Improvement in foundry methods for casting metallic aluminum, the result of long experience and of increased knowledge of suitable alloys, has made it possible for metallic aluminum to compete both with other sheet metals and with wood in the manufacture of automobile bodies. Large sections of aluminum castings are now in use in making touring cars and the inclosed bodies of certain other motor cars, which was not practicable 10 years ago. Cast aluminum is now also used for making automobile dashes. The advantages of aluminum construction are that bodies made of it are lighter than those made of other sheet metal and have a rigid surface which will not dent easily when handled. They are also safer in case of accident. The aluminum surface retains paint well, and the increased rigidity makes the car more durable.

The applications of metallic aluminum during the war in Europe have been many, and consequently the demand for it has been great. Duralumin, an alloy of aluminum containing 3 per cent. of copper and 1 per cent. of magnesium, has been extensively used in the manufacture of cartridges for rifles, shells, helmets, grenades, and, with soft iron, of shell fuses. In France its use in cartridges is said to have been abandoned, but there has been a great

[1] A very interesting discussion on what has been termed the primary and secondary market for aluminum is given in THE METAL INDUSTRY, January, 1916, p. 11, and February, 1916, p. 81.

demand for it everywhere for camp equipment and in the construction of air craft of all kinds. In the United States its use in the manufacture of automobiles, air ships and miscellaneous war supplies has been very great.

During the last few years steel-reinforced aluminum cables have come into use for overhead power lines. In the cable the aluminum wires are laid over a core of high-tensile steel, which bears the greater part of the strain when the cable is erected. The price of aluminum having become so high, it is reported that certain transmission lines in the United States have actually been replaced by copper wire with substantial financial gain. Reported thefts of aluminum wire attest the present value of the metal.

The uses of aluminum dust or powder have been mentioned in preceding reports. The powder is of value in metallurgy as a precipitant of the precious metals in the cyanide process. It is also used as a reducing agent, as in the Goldschmidt thermit process of welding. It is a constituent of bronze powder in the preparation of aluminum paint. One of the most interesting uses of aluminum dust at the present time is in the manufacture of explosives. Aluminum dust mixed with ammonium nitrate produces an explosive called "ammonal" that has given good results in mining and in shells. It has the advantage of being insensitive, is very stable, and is found to remain in good order for long periods.

PROCESS OF PRODUCING METALLIC ALUMINUM.

Grenville Mellen[1] has patented a process for extracting aluminum from clay, kaolin or aluminum silicates in general, which is as follows: The clay is fused with sodium sulphate in the presence of sulphuric acid, or with its equivalent of acid sodium sulphate, in such proportion as to form aluminum sulphate and free silica. The fusion product after cooling is dissolved in water, filtered and treated with sodium fluoride. The aluminum fluoride which separates is fused with common salt and is electrolyzed.

ALLOYS.

A. Wilm[2] has found that a valuable improvement in aluminum alloys results from the combination of small quantities of manganese with aluminum, magnesium and copper. The properties of the alloys with these four metals may be modified according to the proportions of manganese in combination. Different proportions of the metals which may be used are mentioned.

W. A. McAdams[3] has invented an aluminum alloy that is particularly adapted for casting. It consists of aluminum, 82 parts by weight; silver, 1 part; copper, 12 parts, and cadmium, 5 parts. In forming the alloy the aluminum is first melted, copper is then added, and the two metals are melted together. Then the silver is added and the temperature is lowered, but kept high enough to allow the cadmium to melt when it is introduced. The mixture is thoroughly stirred and then poured into molds to form the articles to be cast or ingots for shipment.

ALUMINUM SOLDER.

J. F. Gross[4] has invented a solder for use with aluminum or with aluminum and other metals. The composition of the solder is as follows: Block tin, 80 parts; lead, 16 parts; aluminum, 8 parts; zinc, 16 parts, and phosphorus tin, 8 parts. These elements are fused or melted together in the usual manner and molded into any desired shape.

[1] U. S. patent 1160431, dated November 16, 1915.
[2] U. S. patent 1130785, dated March 9, 1915.
[3] U. S. patent 1146185, dated July 13, 1915.
[4] U. S. patent 1145307, dated July 6, 1915.
[5] U. S. patent 1161612, dated November 23, 1915.
[6] U. S. patent 1139923, dated May 18, 1915.
[7] U. S. patent 1130196, dated March 2, 1915.

J. Cayocca[5] has invented a solder designed for use with metallic aluminum without the use of an acid or flux. The solder is claimed to be noncorrosive and to have the appearance of the metal treated. It consists of tin, 12.8 ounces; lead, 3.2 ounces, and aluminum, 1 ounce. The ingredients are melted in the proportion stated and molded into bars of convenient size for handling.

E. Thaulow[6] has invented a compound to be used in welding aluminum and alloys containing aluminum. It has been found that a mixture of borax and sodium bisulphate is well adapted for this purpose, and the general claims made include these two chemical compounds.

F. Pucillo[7] has patented a process of treating aluminum to render it resistent to chemical attack, even at high temperatures. The treatment is applicable to castings, sheets, wire, tubes or objects in general. It consists of treating the metal or object successively with alkaline solutions, acids, chlorides and other salts and mineral oils.

F. A. Roux[1] has patented a process for the treatment of surfaces of aluminum or of alloys of aluminum in order to prepare them to receive a metallic deposit. After the surface of the metal or alloy has been thoroughly cleansed it is subjected to the action of diluted hydracids or alkalies to which has been added a salt of tin or other soluble metal. After rinsing, the surfaces are passed through a salt solution capable of fixing on them the tin or other metal and at the same time of expelling the hydrogen inclosed in the pulverulent metallic deposit formed on the aluminum. The aluminum salts and the alums in a saturated and somewhat warm solution are particularly suitable for this process, the more so as they have the advantageous property of dissolving the metallic oxides.

J. A. Hall[2] has invented an improved process of plating aluminum with such metals as copper, silver and nickel. The surface of the aluminum is cleansed and the surface is plated with zinc by electro-deposition. This is effected very quickly. The surface is then plated with copper or silver. The second plating process consumes a few hours. The details and modifications required under peculiar conditions are described in the text of the patent.

A patent by Grenville Mellen[3] covers a process of melting aluminum or aluminum alloys. Another by J. W. Lawrie[4] involves a process of treating aluminum screenings, dross, slags or analogous materials containing metallic aluminum.

H. W. Gillett,[5] of the Bureau of Mines, states that in melting aluminum chips the recoveries are usually comparatively low, owing to the quantities of dross that are formed. The reason for this is that the larger part of the aluminum chips are coated with a very thin film of aluminum oxide which prevents actual metallic contact and consequent welding together unless the superficial film is ruptured in some way or dissolved.

PRODUCTION AND CONSUMPTION.

The United States leads the nations in the production of metallic aluminum. These figures give production to 1903 and consumption of the metal since that year.

Aluminum produced or consumed in the United States, 1885-1915, in pounds.

1885	283	1891	150,000	1897	4,000,000
1886	3,000	1892	259,885	1898	5,200,000
1887	18,000	1893	333,629	1899	6,500,000
1888	19,000	1894	550,000	1900	7,150,000
1889	47,468	1895	920,000	1901	7,150,000
1890	61,281	1896	1,300,000	1902	7,300,000

[1] U. S. patent 1144000, dated June 22, 1915.
[2] U. S. patent 1147718, dated July 27, 1915.
[3] U. S. patent 1160430, dated November 16, 1915.
[4] U. S. patent 1156606, dated October 12, 1915.
[5] THE METAL INDUSTRY, October, 1915, pp. 417-418.

1903	7,500,000	1908	[1]11,152,000	1913	[1]72,379,000
1904	[1]8,600,000	1909	[1]34,210,000	1914	[1]79,129,000
1905	[1]11,347,000	1910	[1]47,734,000	1915	[2]99,806,000
1906	[1]14,910,000	1911	[1]46,125,000		
1907	[1]17,211,000	1912	[1]65,607,000		556,672,546

The secondary aluminum, which is that obtained from dross and scrap, produced in 1915, was 5,700 short tons; the recovered aluminum contained in alloys was 2,800 short tons.

ECONOMIC METHODS OF PREPARING METAL SHAVINGS FOR PACKING

How They Handle This Scrap Metal Problem in England.

By R. Philipp.

In a contribution to a Continental Engineering Society, Mr. Philipp referred to economic methods of handling metal shavings with special regard to the best ways of preparing them for packing.

One of the great difficulties in the shipment of metal shavings is that unless they are mixed with a sufficient amount of very fine material, they occupy a volume out of proportion to their weight, and naturally increase freight charges, sometimes to a prohibitive extent, or, in any case, they materially reduce the price which a shop can get for its waste metal.

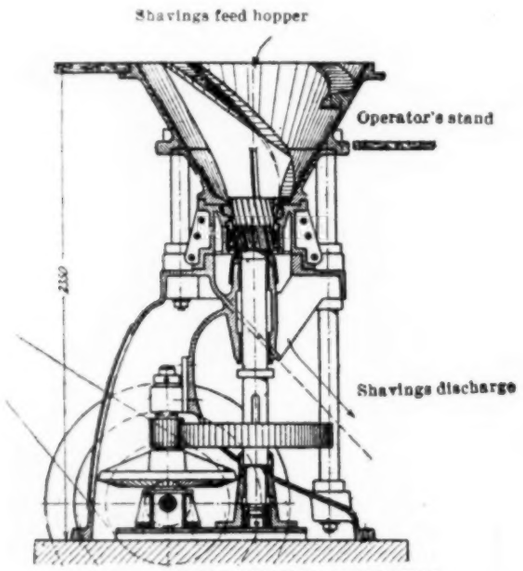

FIG. 1. METAL SHAVINGS CRUSHER.

Of late (for about six years) serious efforts have been made to prepare the shavings at the plant for economic shipment. Messrs. Jones and Lamson have provided on their turret lathes an arrangement for breaking up the shaving as it throws off. The device consists of a little bridge over which the shaving has to run; at the end of it the shaving is sharply deflected into another direction and broken thereby. This device did not prove practical.

Another attempt was to arrange the cutting itself in such a manner as to prevent the formation of long shavings. This may be done by giving the tool a peculiar shape, such as spoon shape, which prevents the cutting from coming out in a smooth ribbon, prevents it from twisting, and forces it to run in a plane. This gives the shaving a bend which with many kinds of metal make it brittle. This process has only a very limited application. Another proposal belonging to the same class was to set the cutting edge of the tool at right angles to the axis of rotation. For heavy work and for many kinds of metal this is not adaptable because it increases the power consumption and does not prevent the formation of long, strong shavings.

Attempts to cut the shavings themselves likewise did not prove successful because thin shavings can be cut only with very sharp tools, and unless the tools are quite sharp the shavings begin to bend and clog the machinery. Further, cutting requires rapid and uniform feeding of the shavings, which is not always possible, and even if all these difficulties have been overcome, the output even at the high speed of cutting, will be quite small.

Another process which is used to a certain extent by briquetting concerns consists in allowing the shavings to get oxidized. This makes them somewhat brittle, so that they can be broken up in a rolling mill or coal crusher. Before, however, they can be sent to the briquetting presses they must be passed through a screen so as to eliminate large lumps and pieces of shavings which might injure the presses. One of the disadvantages of this process is that the metal, being partly oxidized, is of lower quality.

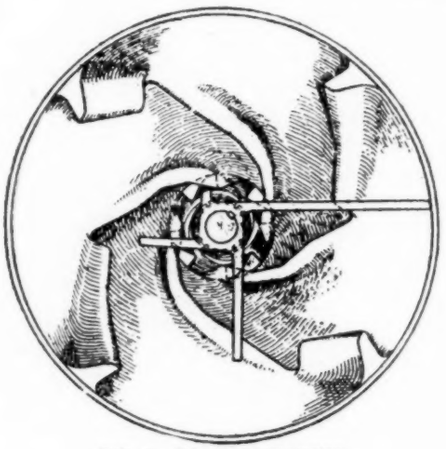

FIG. 2. FEEDING HOPPER.

Hammer mills can be also used for this purpose, but the disadvantage of such types of mills lies in the fact that the shavings are apt to roll about the rollers, sometimes to such an extent that it requires a hammer and chisel to get them away. The application of scrapers does not entirely eliminate this evil, besides, it is necessary for various reasons to make one of the rolls adjustable, which complicates the use of scrapers.

The locomotive firm of Henschel & Son has built for its own use a kind of rolling mill consisting of two geared rollers, a characteristic feature of this construction being that both rollers are of the same diameter and mesh from top outward. At the outer sides of the rollers are located sharp deflectors. One of the advantages of this construction is that it can take care of large bales of shavings because the rolling breaks up the bales. On other hand, however, this construction did not prevent the shavings from twisting all about the rolls even though the deflector could be made very strong and could be placed quite close to the rigidly held rolls.

There is another process, namely, that of baling the

shavings; in this case it must be mixed with a certain amount of thin sheet pieces and wire. The baling press consists in this case of a large box with four movable holes. After this box has been filled with shavings the cover is mechanically forced on and then first one of the side holes and next two more touching it are gradually forced in. The press consumes about 175 h.-p.; 25 h.-p. for forcing on the cover, 50 h.-p. to move the first side hole, and 100 h.-p. to force in the other two holes in contact with the first one. Six bales can be made in this way per hour. In order, however, that they should maintain their shape, the bottom of the box must be covered with sheet or wire; then the shavings come in the middle and the top is again covered with sheet or wire. In machine shops this process is, therefore, not applicable since there is no sheet or wire waste available in the first place, and in the second place the space required and the cost of operation are prohibitive.

Henschel & Son build the shavings breaker and feeding hopper, shown in Figs. 1 and 2. Tough shavings are apt to wrap themselves around the rolls. This property has been made use of here. The roll of peculiar shape rotates in a funnel which is provided with spirally located guides forming, as they go downward, channels. Ribs on the roller gradually force the shavings into the passage where they are more and more compressed and shifted outward. By an appropriate formation of the ribs in the funnel and on the roll, the shavings are uniformly distributed through all the channels over the entire cross section of the roll. With say 30 r.p.m. of the roll, with eight ribs in the funnel and 20 on the roll itself, 4,800 cuts are made per minute. To this must be added that by being compressed in the channels the shavings are broken to pieces; there is practically no actual cutting which is necessary only in the case of very tough shavings or pieces of wire and sheet metal. Because of the very low velocity of the rolls, which is from 20 to 25 r.p.m. and has at most a diameter of 200 mm. (say 8 in.) there are no violent blows, and this reduces the work of the apparatus.

The power of consumption varies quite materially. It was found that the average power consumption of the larger units for an output of 2,500 to 3,000 kg. (5,500 to 6,600 lb. per hr.) was only 13 kw. The largest output obtainable from one engine was 3,500 kg. (7,700 pounds of manganese copper in 25 minutes), which was obtained with the engine driven by an electric motor rotated at 25 h.-p. The cost of breaking up the shavings is approximately one shilling (25 cts.) per ton. The main elements of this cost are power consumption and wages for bringing the material in and taking it away. The wear of the machine itself does not amount to anything for all practical purposes.

PHOSPHOR BRONZE CASTINGS.

An Example of Impractical Specifications.

A manufacturer writes:

"We are having some difficulty in making phosphor bronze castings, the specifications requiring a tensile strength of 35,000 lbs. and 20 per cent. elongation in 2 inches. We have had no difficulty in getting the tensile strength, but we have failed to get the elongation.

"Our mixture is made 80 per cent. copper, 10 per cent. tin, 10 per cent. lead and ½ lb. of 30 per cent. phosphor copper and the following is the result of the test from this metal:

Maximum strength per sq. in.	32,000 lbs.
Yield point per sq. in.....	24,500 "
Elongation in 2 in.....	60 per cent.
Reduction of area.....	5.5 " "

This was melted and poured in a medium heat. Can you give us a mixture of phosphor bronze which will give us the desired result and meet these specifications, and is it possible to fulfill these requirements with a mixture of phosphor bronze?"

THE REPLY.

The physical results you have given are above the average for the mixture you have mentioned. The following figures are taken from a large number of tests made by a firm which has a reputation for careful melting:

Maximum strength. Lbs.	Elastic limit. Lbs.	Elongation in 2 in. %	Reduction of area. %
26,600	21,600	3.5	4.0
26,500	26,250	3.5	4.0
28,500	21,600	3.5	4.0
32,000	21,000	3.3	3.0
30,500	19,500	11.0	8.5
33,500	16,000	6.0	5.0
35,290	22,050	5.0	6.0
31,000	23,000	5.0	5.0

It is an injustice to manufacturers to ask them to bid on a maximum specification such as 35,000 tensile and 20 per cent. elongation for the standard phosphor bronze bearing alloy mentioned. Such specifications are quite common and they are always due to ignorance of what the average physical characteristics of the various commercial alloys are. A tensile strength of 25,000 and an elongation of 3 per cent. would be a reasonable requirement for standard phosphor bronze bearing alloy. The specification named above cannot be met commercially. It is to prevent the submission of such specifications as this that the American Institute of Metals and American Society for Testing Materials have begun the collection of the average physical characteristics of the various commonly used alloys. The principal manufacturers of non-ferrous metals in the United States have been asked to aid in this work and when the results are tabulated they will form a basis for reasonable specifications and give engineers reliable data upon which to base their calculations.—J. L. J.

ALLOYS USED IN ZEPPELIN CONSTRUCTION.

The alloys entering into the construction of a Zeppelin brought down in France are given as below by the Revue des Produits Chèmiques, with their analyses:

	Angle Brackets. Per Cent.	Channel Sections. Per Cent.	Braces. Per Cent.
Aluminum	90.27	88.68	99.07
Zinc	7.80	9.10	0.13
Iron	0.45	0.43	0.38
Silicon	0.37	0.49	0.36
Copper	0.73	0.70	0.06
Tin	0.11	0.15	...
Manganese	0.27	0.45	...
Nickel	Trace	Trace	Trace

The braces are evidently commercial aluminum, while the other parts are alloys of aluminum, zinc, copper and manganese. The absence of magnesium is noticeable The impression has been that this metal was extensively used, at least as an alloy.

EXPERIENCE IN DRAWING THIN WHITE-METAL TUBES*

How a Practical Metal Man Solved the Problem.

By Herbert J. Randall.

Several years ago it became necessary to draw long, thin shells, or tubes, from Britannia white metal, and I was unfortunately unable to get the exact information I required at that time.

I was advised to try the extrusion method of producing tubes, but as we had only single and double-action presses to do the work, extruding was out of the question. Since then, however, I have experimented extensively on this problem, with the result that about two years ago I obtained a shell 1 13-16 in. in diameter by 6¾ in. long, with a wall 0.028 in. thick. It was highly polished and secured in four operations, including the cutting of the blank.

The second, third and fourth dies can be used in any ordinary single-action press, provided the stroke is long enough.

The dies, Fig. 2, for the second operation brought the walls of the tube down to 0.037 in. thick and lengthened it to 3¾ in. The cup, after passing through the first-operation dies, was inverted over the die for the second operation. This die was made 0.010 in. smaller on the outside than the inside diameter of the work, to facilitate matters when feeding, as the press could be run continuously, the work dropping down through the center of the die into a box.

The third operation consists of the same operation as

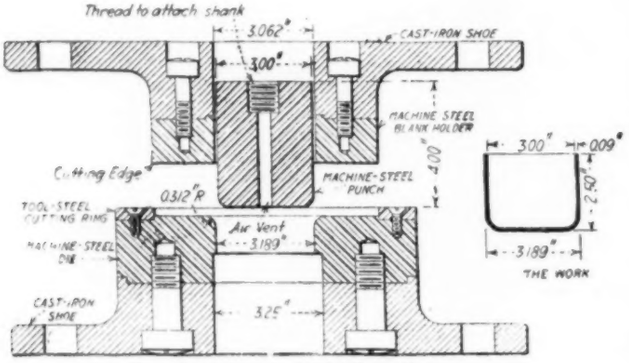

Fig 1 First Operation, Cut and Draw Dies

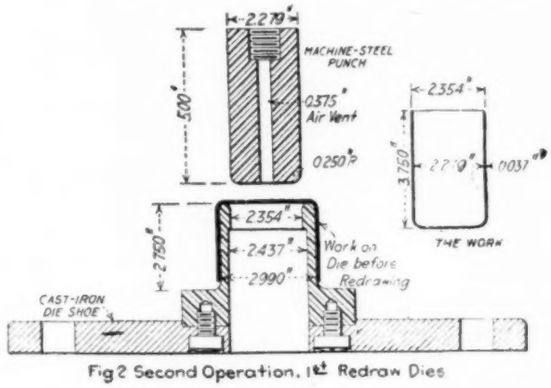

Fig 2 Second Operation, 1st Redraw Dies

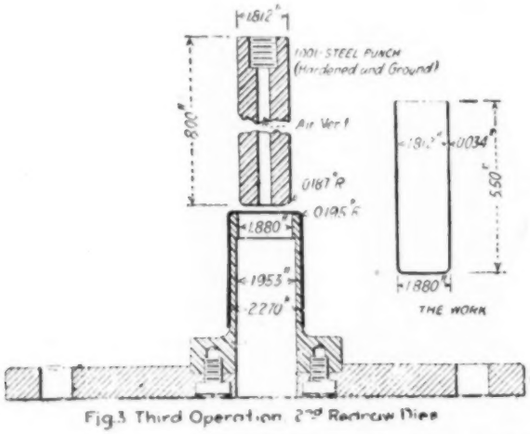

Fig 3 Third Operation, 2nd Redraw Dies

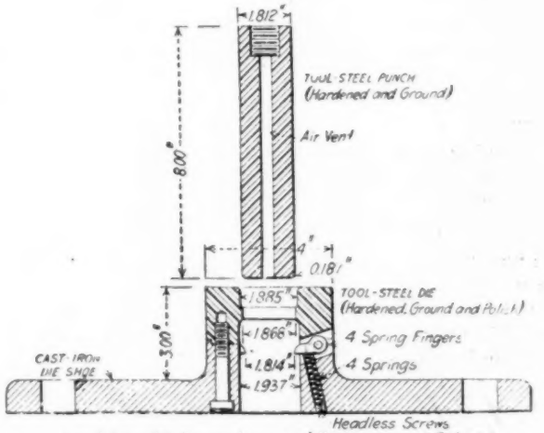

Fig 4 Fourth Operation, 3rd Redraw and Polish

DIES USED IN VARIOUS OPERATIONS IN MAKING THIN WHITE METAL TUBES.

The sketches of the dies practically explain themselves. Fig. 1 represents the cutting and first drawing dies used in a double-action press, with a blank 6¼ in. square and 0.094 in. thick. It was highly polished and secured in four operations, including the cutting of the blank.

During the experiments I always had good results until coming to the final operations; then the percentage of broken pieces would be anywhere between 50 to 75, sometimes more, which was anything but satisfactory. That was with the ordinary way of redrawing, but as I had spent lots of time trying to get the desired results, I thought it could do no harm to try to turn the preceding cup inside out. So I made the second—and third—operation, redrawing dies on that dies, and thereafter we had practically no trouble.

in the second, only the die was made to draw the work down to the required inside diameter with walls 0.034 in thick, giving a blank 5½ in. long. See Fig. 3.

The punch for the third operation was used on the fourth or final operation, and the die was made as in Fig. 4. This completed the work, making a cup or tube 1 13-16 in., inside diameter, 6¾ in. long and 0.028 in. thickness of wall, with a high polish on the outside. Of course, this die had to be highly polished to get these results, and the punch was hardened, ground and lapped perfectly true, as the work after passing through this last die held tightly to the punch.

The dies for the first, second and third operations were made of machine steel, and left soft but polished, and the cutting ring for the first operation was of tool steel not hardened.

*From the American Machinist, 1916.

The work automatically stripped itself from the punches in the first three operations, as there was a little outward spring to the top of the walls of the work. In the last-operation dies four spring fingers were placed around the die, to just let the punch through without touching. When the work was on the punch, these fingers would spring downward and over the top, thus stripping it off from the punch on the upward stroke.

The only lubricant used on these four operations was a mixture of soft-soap, soda, lard oil and water, all boiled together and left to cool before using.

The uneven ends of the work were not trued off between operations, as that was unnecessary and would only have wasted stock and shortened the final tube. The work was not annealed, or touched between operations.

MAKING YELLOW BRASS INGOTS FROM YELLLOW TURNINGS

A Description of a Practical Method for Producing This Important Foundry Product.

Written for The Metal Industry.

By Thomas Adams, Smelter Foreman

PREPARATION AND MELTING.

In the treatment of yellow turnings, care must be taken to see that the turnings are free from moisture, and the iron all extracted by running same through a magnetic separator of a modern type. The object in having the turnings free from moisture is this: When the turnings are charged into the hot crucible in moist form, combustion takes place, causing a penetration of the moisture into the graphite crucible which immediately causes disintegration of the graphite and the result is, the crucible will only yield 50 per cent. of its heat units, whereas, if the turnings were dry the crucible will yield normal results, provided, of course, that the proper care has been taken of the crucible, viz.: proper annealing and handling.

In putting the turnings in the crucibles a large iron scoop shaped like the scoop such as your grocer uses for handling sugar, is very good, as it prevents the turnings from spilling into the fire. To facilitate reduction of the turnings and prevent excessive oxidation, two pounds of de-oxidizer should be placed in the pot immediately after charging, thus forming a thin coating on top of the charge and preventing the zinc from volatilizing. The de-oxidizer is not in any way detrimental to the metal. In fact, it improves the color of same. After the metal is poured into the molds, it pays to skim the molds with a light iron rod bent over at an acute angle.

Control of the heat in melting yellow brass is a very important factor which few smelters observe. Even with coke fires, the draft can be so regulated by means of blocking the flue with brick made for the purpose that when the melting point of the brass has been reached, the source of heat should be controlled in such a manner to avoid excessive volatilizing of the zinc. Usually, the smelters maintain the same heat from start to finish and oft-times declare that the metal being treated is inferior.

OVERCOMING A PREJUDICE

For years, the brass foundries have been sceptical about using brass in ingot form and would prefer to follow up the old rule of their forefathers and use scrap metals. A number of these foundries are still using scrap, their claim being that they know what they are doing when they use scrap. As a matter of fact, they are making a great mistake and the writer has been able to convince a number of our largest foundries of the error of their ways. The scrap, they claim, can be purchased cheaper; we will allow that to be the case. Now comes the problem. Nine cases out of ten, they know not what classes of metal the scrap contains and many castings are ruined on account of some careless furnace-tender using his so-called good judgment in the assimulation of the scrap and, as a result, the castings have to be remelted and copper, tin or zinc added to bring the metal up to a healthy condition.

All this trouble can be avoided by buying yellow brass ingot of known analysis from a reliable concern. True, a number of brass foundries have tried the ingot brass without success, the metal they had purchased having yielded poor results, consequently, they could not afford to experiment further with ingot metal when they could get better results by using scrap. Unfortunately, these foundries had bought their ingot metal from a concern who failed to turn out a good ingot, and which, perhaps, claimed the metal was better than the next man's ingot. It is unfortunate that we have a few people to-day turning out bad metal and obtaining good prices for it. However, their days are numbered and they will be no longer a pest to the market. Moreover, there are a number of good firms making ingots whom you can rely upon and the day is not far distant when the brass foundries will use nothing else.

By way of illustrating the danger of using scrap metal. More or less of the scrap after it has been picked over carefully, will still contain poisonous metals such as tobin and manganese bronze. These metals in casting form after they have been subjected to oxidization, moisture and age of time, resemble good red brass and the keen eye of the furnace-tender overlooks this point unless he goes to the extreme limit of filing each individual piece, which is not an economical process by a long shot; whereas, if he has an ingot which he can depend upon, he is saving much time and expense. Another argument the brass foundry will put up in the connection of using ingots is this: Their loss in skimming is greater by using ingots than by using scrap. In this they are not entirely wrong because up to a year or so ago, the people manufacturing red brass ingots were not over careful in skimming their metal, thus giving a rough face to the ingot which naturally would result in a larger loss in melting by the brass foundry, than if the ingot had a smooth surface. Manufacturing concerns have been experimenting along these lines and one or two have been successful enough to eliminate all signs of oxidation on the face of their ingot. These experiments, however, cost money and consequently this metal, although highly valued costs a good bit more than the metal that has not undergone this special treatment. However, Mr. brass foundry, do not be afraid to use an ingot from a reliable house. You will not only be helping yourself but you will be helping others to make a living.

REMOVAL OF FIRE COAT FROM GOLD.

In the formula given in the article "Removal of Fire Coat from Gold" in the August issue of The Metal Industry six ounces of cyanide of sodium may be substituted for the six ounces of cyanide of potassium.

EDITORIAL

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FOUNDRYMEN'S CONVENTION

The opening pages of this issue of THE METAL INDUSTRY are devoted to the story of the preparations that have been made at Cleveland, Ohio, for the annual convention and exhibition of the Allied Foundrymen's Associations for 1916. As told there, these associations, the American Institute of Metals and the American Foundrymen's Association, will father this year the exhibition of foundry supplies and apparatus that is held in connection with the conventions. This is a return to old conditions, and judging from the list of exhibitors who have engaged space at the Coliseum, as published in the August issue of THE METAL INDUSTRY, the exhibition will eclipse that of former years, both in number and in extent of exhibits.

There are several other points of interest regarding the convention that are revealed in our opening article. These are features relating to the conduct of the event about which THE METAL INDUSTRY has spoken several times, and while we do not want to take to ourselves undue credit, we wish to extend to the committees in charge our commendation upon the changes they have made. The first of these points that we refer to is the holding of the meetings of each association in its own hotel and removed from the noise and counter attraction of the exhibition. This is as it should be, and we predict successful and productive meetings. The second point is that of confining the sessions to the mornings, thus leaving the afternoons free for plant visitations, the exhibition, or for anything else that may warrant the attention of the delegate.

The third point is the setting aside of a session at which practical foundry questions may be brought up and discussed. As we have said before, there is nothing that will drive away and cause the practical foundry worker to lose interest quicker than to have to try and assimilate matter that is clear over his head, but give him words of one syllable, so to speak, concerning his daily work and he is all ears at once.

The things we have outlined, together with the "play time" offerings of the convention, bid fair to make the 1916 convention at Cleveland, Ohio, September 11 to 16, inclusive, the greatest ever.

CRUCIBLE JUSTICE

In the August issue of THE METAL INDUSTRY we had something to say about the treatment we had seen accorded to crucibles used in melting metals. We also remarked that it was possible to repair "failed" crucibles by the use of some refractory material so that they would give additional heats. We are glad now to be able to record the results of a test of this character. On page

396 of this issue of THE METAL INDUSTRY will be found an interesting story, told by pictures as well as by text, of how a large crucible was saved after it had failed on the first heat. From the standpoint of reduction of melting cost alone the results of this test are most valuable, and we hope that in the near future we shall hear of the "recovery" of a large number of crippled "soldiers." Turn now to page 396 and read the story there.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY.

THE CALL OF THE AMERICAN ELECTRO-PLATERS' SOCIETY

To the Editor of THE METAL INDUSTRY:

Mr. Manufacturer, are you aware of the existence of a society of foreman electro-platers? You certainly cannot be ignorant of this fact, not if you read the trade journals and periodicals of the metal trades, for there is not one of them that does not have something in each issue regarding this society. But are you aware of the fact that this society is organized for the express purpose of educating the foreman electro-plater, the man on whom you depend so much for the finish of your manufactured article?

It is my purpose in writing this letter to acquaint you, Mr. Manufacturer and Mr. Electro-Plater, with this society and if possible arouse you both to the benefits you can derive by becoming thus interested enough to give it your hearty co-operation. Also to show you what it has done and is doing for the advancement of the art of the electro-deposition of metals; to assist you in obtaining a better finished article and to help the foreman plater to produce this finish in a more modern and efficient manner. By so doing it does benefit you, Mr. Manufacturer, as well as your foreman plater. I have heard it said by some superintendents that the American Electro-Platers' Society was or is a union of platers. That may be, but not in the sense of "union labor" for we do not allow salaries or wages to be discussed or mentioned at all in our meetings. Nor do we favor or oppose union labor. We are for the open shop. At our meetings, which are held by the different branch societies, we transact such business as is necessary for the organization and then one or more papers are read by some members on an interesting topic, such as, brass, zinc, copper, nickel, silver or gold solutions, cleaning solution, coloring, lacquering or electrical apparatus, etc. Then we have an open discussion by the members and in this way practical and technical knowledge is obtained from not only one man but many who are doing this work constantly and who strive to find the best method of producing results with the least amount of labor and equipment.

We also have in connection with each branch society a laboratory and a class in chemistry. To these laboratories we can take our solutions and analyze them and also do some research work under the direction of a competent instructor in chemistry. Some of the branches have a laboratory of their own; some have the use of university laboratories while others are given the use of the laboratory in the high school one evening a week and in addition the services and assistance of the instructor. The Detroit Branch has the use of the one in the Cass Technical High School and in the plans now being prepared for the new school to be built next year a complete electro-plating plant will be included and classes in this art will be established. The high school student will then be taught the art of the electro deposition of metals in the same way as other trades are at present being taught them. Evening classes will also be established at which time any one desiring to take up this course of study may do so.

This has all come about through the efforts of the Detroit Branch of the American Electro-Platers' Society. So, Mr. Manufacturer, you can see that we are carrying out our purpose of education not only for the benefit of the members of the society but for the public in general and especially for the younger generation and we need your hearty co-operation.

Do you know whether your plater is a member of this society? Should you not have interest enough in such a good cause as to inquire of him about it? And if he is not should you not suggest to him that he become a member? I am sure you want him to have all the information obtainable and also have him up to date in all the modern methods of the trade.

We have what is know as the Supreme Society which meets once a year in the different large cities. Next year the Supreme Society will meet at St. Louis, Mo., between the 1st and 10th of July, 1917; the exact dates at present not being set. It generally meets for three days and at these yearly meetings or conventions representatives of every branch are present. The business of the society is transacted and many papers, both technical and practical, are read and discussed. Some of the manufacturers give their foreman platers a vacation and pay their expenses to these yearly meetings and they receive in return many new and useful suggestions from him during the intervening year. Evidently the manufacturers think it a good investment. There are also exhibits of modern solutions, tanks and in fact all equipment needed in a plating room.

The Supreme Society also publishes a Monthly Bulletin of which each member receives a copy. In this Bulletin are published the proceedings of the meetings of the various branches and their discussions. Also some practical and technical articles, and there is not an advertisement of any sort in this bulletin as we do not boost any certain make of apparatus or chemical because they are made by a certain manufacturer. We simply try out everything and discuss them on their merits. Nor do we cater to any special supply house or chemical manufacturer, but our object is to get results in the most economical and efficient manner.

There is also in connection with the Supreme Society an employment bureau maintained for the benefit of the manufacturer and electro-plater free of charge. By writing to the Supreme Secretary, Walter Fraine, 507 Grand avenue, Dayton, Ohio, the manufacturer can obtain the address of the best man suited for his kind of work and get in touch with him.

The membership of the society consists of active, associate and honorary members. The active are foreman electro-platers and they alone have an active part in managing the affairs of the society and must all qualify for membership by passing the requirements of an examining board. They must have had five years active experience at the electro-plating trade and also had charge of a plating room in the capacity of foreman for one year as well as having a moral standing.

The associate members are such men as have passed the above requirements, but are not employed actively as foreman platers but as salesmen of plating supplies, etc., chemists, electro-chemists and electricians employed in the plating departments. These members can also present papers at meetings and which are also published in the Bulletin and help in the discussions.

The honorary members are elected by the active members and consist of men of high standing and authority on chemistry and electricity, such as professors at universities and high schools and electro chemists. These men are also a great help to the educational feature of the society and write very good papers for the society.

Our dues are $1 with application, $5 per year payable quarterly in advance. I trust, Mr. Manufacturer, that you now have a better understanding of what this society stands for and that after due consideration on your part you will give us, as mentioned, your hearty co-operation. Also prevail upon your foreman to become a member of this society. We have eighteen

branches scattered throughout the country and your foreman can join the nearest branch. If he cannot attend all the meetings he will receive a bulletin each month and by writing to the local secretary he can receive any information he desires.

As the meetings of most of the branches are only held once a month some concerns pay their foreman's expenses and give them time off so that they can attend them. These concerns are well repaid for this in the knowledge the foreman has gained by having been present. The more members we get the more branches there will be organized and the closer they will be together. Eventually every town with ten or more platers will have a branch society and then all platers can attend the meetings with very little expense. This, Mr. Manufacturer, will be a great benefit to you.

We have also gained the interest of the Bureau of Standards of Washington, D. C., in that they have had representatives at the last two yearly conventions and at both of these conventions these representatives read papers. It is our desire, and we are working toward that end, to get the Bureau of Standards to work together with our society and establish standards for all plating solution in the same way as they have done for the electro-typing trade.

Now, Mr. Plater, can you afford not to be a member of this society? Can you not see the wisdom of it? Do you not at times get into a place where you desire help to solve some problems in the plating room? The members of the society can and will help you willingly in anything you may desire to know about. How to produce a certain finish and also method of doing any particular work with which you are not familiar. By being a member of the society you can write to the local secretary and he will give you the address of the member best qualified to help you.

There is also the employment bureau to which you can apply for a position such as you desire and at the first opportunity the Supreme Secretary has such a position he will let you know of it. Stop and consider all of the benefits you can avail yourself of by joining. All of the members consider it a privilege to belong to this society and also that the small amount paid in dues does not nearly pay for the good fellowship and pleasure participated in. To say nothing of the help received, continually and the growth of knowledge and understanding of chemistry, etc.

There are many old time electro-platers who think that we are a lot of scrubs and would not join the society because they do not care to be instructors to these scrubs and impart all they know about the trade. For what these platers do know cost them long years of hard work and some sleepless nights and more "sprees," for that seemed to be the way with the old timers when they ran up against some problem they could not solve. They would get "tanked up" and forget it for awhile. I can sympathize how you feel, fellow electro-platers, but do not waste time in that way. Join the society now. We will not bother you for your secrets of the trade. Some men like you have joined and after awhile they found out that their secrets were generally known and some of them discarded for something better. Some of these men also forgot they had any secrets and were actually adopting some of the new methods of which they knew nothing before. Instead of being instructors to scrubs they are actually deriving much knowledge from the society.

I fully trust that the society will grow in members during the present year and that you, Mr. Manufacturer and Mr. Electro-Plater, will gain in every way by co-operating with it. The government, the universities, the public high schools and technical schools will give us all the assistance we ask for when they see organized men behind it. This has been demonstrated in Detroit, Toronto, Rochester, Toledo, Cleveland, Indianapolis, Chicago, Philadelphia, Providence, Bridgeport, New York, Newark, St. Louis, Milwaukee, Buffalo, Cincinnati, Dayton and other cities will soon be following.

Think of the opportunity; you are helping to provide for your children and the future generation (think how you had to work out your own salvation) by getting these cities to provide a demonstrating electro-plating plant in the public training schools. Also think of how you can increase your value to your employer by taking up these studies of chemistry. We extend to you a standing invitation to attend a meeting and get acquainted with its proceedings and how they are conducted. We want to see both the manufacturer and electro-plater there and if you think well of it fill out an application and join us, Mr. Plater. Do not put it off, come now.

T. C. EICHSTAEDT.

RICHARD'S SPECIFIC GRAVITY SCALE

To the Editor of THE METAL INDUSTRY:

In the August number of THE METAL INDUSTRY I read with interest the very able article on "The Manufacture of Solder from Scrap White Metals," by C. F. Loeble.

The statement in this article, which reads: "This scale is based on the different specific gravities of lead and tin, and must always register 51 to 51½ in order to show 50 per cent. tin by analysis," is very misleading and incorrect. While I feel indebted to the author for mentioning the Richards scale, the above statement would show that the Delaware Metal Refinery is misrepresenting in the advertising of this scale, which advertisement reads: "Richards' Specific Gravity Scale will enable any careful person, with a little practice, to approximate within one-quarter of one per cent. the percentage of tin and lead in solder."

The writer of this article is personally responsible for the accuracy of Richard's scales and appliances. In order, therefore, to protect our customers that are using this scale, and convince those that are contemplating use of same, and who may be discouraged by the reading of afore-mentioned statement, I felt that I was thrown on the defensive.

Being responsible for the accuracy of these scales and moulds, each scale is carefully adjusted by the writer, and a perfect bullit of solder, 50 per cent. tin and 50 per cent. lead, is cast in every mould sent out; also a bullit of pure tin. In defense of our advertising matter I accordingly had taken from our files a bullit cast in a mould which was shipped to the Michigan Smelting & Refining Company, of Detroit, Mich., on July 12, 1916; sent same, together with a Richards scale, to the laboratory of Booth, Garrett & Blair, 404 Locust street, Philadelphia, Pa., and received the following report:

August 21, 1916.

Delaware Metal Refinery,
Eighteenth Street and Washington Avenue,
Philadelphia, Pa.

Gentlemen:

We have determined the tin in the so-called 50 per cent. tin button accompanying the Richards balance, which button we have verified by an actual test on this balance as a 50-50 solder, and in which we find:

Tin 50.16

Yours respectfully,
(Signed) Booth, Garrett & Blair.

This proves beyond a doubt that we do not misrepresent in our advertising, and that the assertion made in afore-mentioned article is incorrect. Richards' Specific Gravity Scale stands on its merits, and the writer will guarantee to all that the scale will do all that is claimed of it, that is, approximate within one-quarter of one per cent. of tin in a tin and lead alloy. Be sure your scale is a Richards.

In further defense I refer again to portion of afore-mentioned article, which reads: "This difference between analysis and cone test can be readily understood if you will cut a cone lengthwise you will notice the cavities in it."

In response to this section of article would say that I had a number of tests made and failed to find any cavities in any of the bullits which were cast in moulds and sent all over this country, Canada and England. The explanation of this error is that the cone test referred to was either not made in a Richards mould or else the party making the test did not exercise enough care to make a perfect bullit.

The Richards' Specific Gravity Scale has stood the test for over 30 years, and will continue to register within one-quarter of one per cent. of tin, in a tin and lead alloy, and the bullits cast in Richards' moulds will always be free from cavities.

M. E. BURGETT, Treasurer.

Delaware Metal Refinery.
PHILADELPHIA, Pa., August 24, 1916.

NEW BOOKS

TRANSACTIONS OF THE AMERICAN INSTITUTE OF METALS. Volume 9, 1915. Size 6¼ by 9 inches. 410 pages; also a 36-page appendix containing bulletins and list of members. Bound in cloth. Edited by the Secretary and published by the American Institute of Metals.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

BURNISHING

Q.—We have a lot of copper head lamp reflectors to silver plate and burnish. At present we are burnishing them by hand, which is satisfactory all but for the length of time it takes to burnish them. We have tried buffing them, but it is not satisfactory as it takes too much silver off. Do you know of a process by which these reflectors can be burnished other than by the hand method?

A.—Manufacturers of locomotive headlight reflectors use an automatic burnishing machine for burnishing the silver-plated products.

In this machine the burnishing tool works up and down the entire depth of the reflector, and is automatically timed to confirm with each full stroke of the burnishing tool. Lubrication for the burnishing tool is arranged to flow as the tool works up and down. Afterwards the reflectors are lightly colored upon a soft rouge buff.—C. H. P. Problem 2,342.

CASTING

Q.—We wish to build a large truck radiator of a thin aluminum alloy, that will stand the extreme heat and cold, rough roads and engine vibration. We intend to cast every part of it. Can you advise us of a good mixture.

A.—A majority of the automobile castings made in this country are made from the alloy known as No. 12. This is a good alloy and one that has excellent casting qualities. With care in melting, a tensile strength of 22,000 and an elongation of 1½ per cent. in 2 inches may be obtained in No. 12 alloy castings. It is best made by melting together equal quantities of aluminum and light scrap copper to form a "hardener." By using 14 pounds of hardener and 86 pounds of aluminum, an alloy of copper 7, aluminum 93 is obtained.

Where a somewhat lower tensile strength will suffice and a softer and tougher alloy is wanted No. 22 alloy is recommended.—J. L. J. Problem 2,343.

COPPERING

Q.—I should like to have you give me some information as to the method of acid coppering iron and steel articles. I believe it is known as the acid wash. I have tried pickling first and then dipping in a soluton of sulphate of copper, but only get a very slight film of copper to adhere, the bulk of the deposit wiping off.

A.—What you term acid coppering is merely a copper finish upon iron or steel produced by simple immersion in a dilute sulphate of copper and free acid dip. The trouble you experience in the deposit of copper rubbing off is on account of too dense a solution. To produce results proceed as follows:

Free the articles from grease and then tumble in sawdust so that the articles are perfectly dry. Then immerse in a solution consisting of the following:

Water	1 gallon
Sulphate of copper	2 ounces
Muriatic acid	1 ounce

Immerse the articles in a dry state, afterwards wash well in water and dry. A concentrated solution may be prepared for replenishing or renewing the dip. Dissolve in 1 quart of boiling water, 12 ounces of sulphate of copper, then add 6 ounces of muriatic acid. Add a very small proportion of this solution as required or when the dip becomes weak. Although on account of the small cost of the dip it is advisable to discard the old dip. —C. H. P. Problem 2,344.

DRILLING

Q.—We have considerable trouble with our small sizes of new twist drills used on brass. After they pass through a piece on the drill press they crowd the castings up the drill.

A.—In grinding twist drills for brass work it is better to grind off the lead or rake on the cutting edge and give them a slight lip to prevent bogging-in, especially when breaking through. This will avoid all your trouble and overcome them on all soft metals.—P. W. B. Problem 2,345.

ENAMELING

Q.—Can you give us any information as to how we may overcome the leathery effect we seem to get when using a high gloss enamel on automobile fenders? We have been using a well-known sprayer for a number of years and have had no trouble with the dull enamels or on small surfaces.

A.—The only suggestions we can make to overcome the leathery finish upon large surfaces such as automobile fenders when spraying with a high gloss enamel, would be to use a lower air pressure than when smaller surfaces are coated or procure an enamel that dries a little slower. We would also suggest that the matter be taken up with the manufacturer of the sprayer.—C. H. P. Problem 2,346.

FINISHING

Q.—We want to get a black finish for small steel and iron articles without first applying copper, to be handled in quantities and at a very low cost, and that will, as far as possible, prevent rusting. Can you furnish us one or more formulas for this purpose?

A.—The most effective method for producing a black rust-proof finish upon steel is the nitrate method followed by an immersion in some light vegetable oil, such as palm or cocoanut oil. Paraffin and linseed oil are also used for the same purpose. The oil may be added in small proportions to hard wood sawdust such as maple or birch, and the coated steel articles tumbled therein for a few moments.

The nitrate method is as follows: Heat nitrate of sodium in an iron crucible or pot to 800 degrees Fahr. Immerse the cleansed and dry steel parts, strung upon soft iron wire, in the molten sodium nitrate for a minute or so until a gun metal or slate gray is produced. Cool in boiling water, then oil finish.

The zinc phosphate or boiling method is prepared in an iron tank with steam connections, or a wooden tank may be used with sheets of soft steel fastened to the sides and ends of the tank. Fill this tank with water and heat to the boiling point. While the water is boiling add ½ to 1 ounce per gallon of the following mixture, which has been previously dissolved by heat:

Phosphoric acid (commercial)	1 pint
Finely divided zinc dust	6 ounces
Water	8 ounces

Boil for fifteen minutes or more and add water to replace that lost by boiling. A very small amount of fine iron dust may also be added to the solution when in operation. The small articles may be placed in iron wire baskets and boiled in bulk. It requires at least three hours boiling to produce a finish, and the tone will be a slaty gray, but when the oil is applied a good black finish results.

Phosphate of iron may be prepared in a similar manner to the zinc and used in the same way.—C. H. P. Problem 2,347.

GILDING

Q.—Will you kindly inform me if there is a formula for a gilding dip, which will give a 14-karat color? I have been using a dip, and have been getting a good color from it, but I tried to add copper to get 14 karat, but could only get a fine gold color.

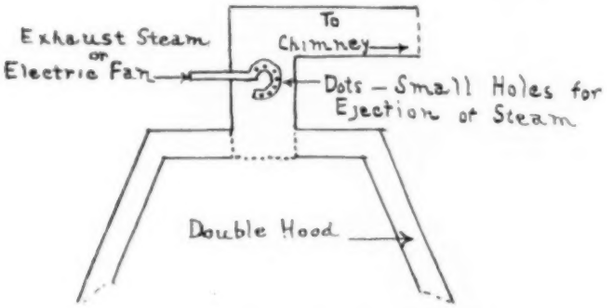
A.—It is difficult to obtain a 14-karat gold from a dip or immersion solution, because copper cannot be deposited from an alkaline solution very successfully and in connection with fine gold, as the gold always comes down first.

The only suggestion we can make is to get a little iron in the solution. Probably the addition of a little yellow prussiate of potash will give sufficient iron or a very small quantity of chloride of iron. This may produce a slightly more reddish tone to your gold deposit.—C. H. P. Problem 2,348.

JAPANNING

Q.—In your July number, under the heading of "Japanning," mention is made of ammonia oxidizing. We have used this formula, and know it to be most practical, but would appreciate what information you have on the general method employed for carrying off the very objectionable fumes.

A.—The most effective method to remove the ammonia fumes from an ammonia copper oxidizing solution when in use is



to have a small double hood placed over the solution. This double hood should be connected with a chimney; or, better still, use a small exhaust fan to draw the fumes upward. If you have exhaust steam, run this into the chimney or pipe connecting with the hood. This steam injection will cause a forced draft. A small electric fan can also be arranged to force a draft.

The hood should be similar to the sketch.—C. H. P. Problem 2,349.

MIXING

Q.—Will you kindly give me a formula for pattern metal that is cheap and which runs smooth? I used 10 parts of lead, 1 part of zinc and 1 part of antimony. This mixture is good for small patterns, but is brittle on large work, as on frames 2 feet square, ¼ inch thick and 2 inches wide.

My molder made a mixture of 8 parts of lead, 1 part of antimony and 1 part of copper and mixed some of the first-mentioned mixture with it. The metal seemed to separate and would not run. What is the trouble with the mixture and can I do anything with it by adding some other metal?

A.—The formula that you are using as a white metal for patterns contains too great a proportion of copper. This causes the separation that you noticed and the lack of fluidity. A metal that is cheap and which runs well may be made from lead 85, tin 15 and antimony 10.—J. L. J. Problem 2,350.

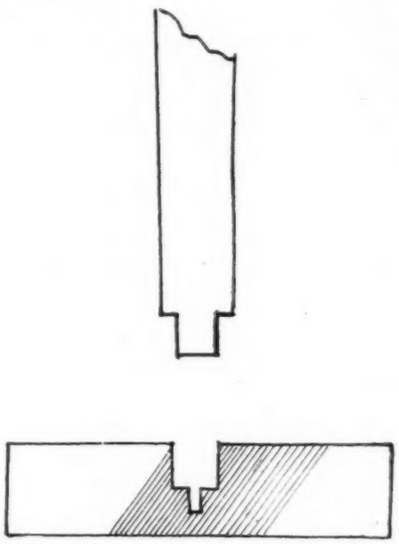
PICKLING

Q.—Would you kindly inform me whether there are any acids to take fire out of sterling silver without having any effect upon the work?

A.—To remove the fire from sterling silver prepare a solution consisting of 1 pound of Edis compound and 2 to 4 ounces of sodium bichromate. Heat the solution to 200 or 212 degrees Fahr. and immerse the annealed silver therein for a few seconds or until the fire is removed. Edis compound is what is commonly known as nitre cake a by-product in the manufacture of nitric acid and is a cheap material.—C. H. P. Problem 2,351.

PRESSING

Q.—Enclosed you will find model in container with sketch. Which would be advisable to form gold and platinum the shape of the model? A punch and die with hammer, or slower pressure of swaging? The sketch enclosed would be the outfit I would attempt it with, with hammer, starting with pallet of gold or platinum. Am I safe or would a seal hand press properly fixed up do better?



A.—The seal hand press would be the safer method of procedure. While gold is the most extensible of all metals if pure, when alloyed with copper, which is in the form in which it is generally used for making jewelry, it becomes harder, less malleable and less ductile, the alloy of 18 per cent. copper breaking under the hammer with a flint-like fracture.

Platinum when pure is close to gold in ductility and malleability, but it always contains even when well refined, other metals of the platinum group that make it more brittle, this being especially the case at the present time.

Where there is liable to be any doubt of the softness of a metal or alloy the slow motion of a press that would give the material a chance to flow is to be preferred to the more severe method of hammering.—J. L. J. Problem 2,352.

RESISTING

Q.—Is there any better soil pipe than the vitrified earthen clay pipe for drains to sewer from plating and dipping departments? The waste material passing through these pipes contains of course large amounts of plating salt solutions, potash, sulphuric and nitric acids, and somewhat smaller amounts of muriatic acid. The best imported German pipes have not been found satisfactory in acid resisting qualities, due to the formation of some hydrofluoric acid in some way unaccounted for within the pipes. In some soda factories porous unglazed (not vitrified) clay pipes are boiled in tar and used for muriatic acid. Is this advisable with the mixture of acids above described?

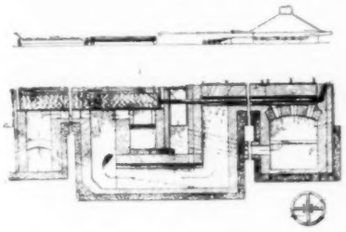
A.—Vitrified earthen clay pipe is used to a greater extent than any other material for sewer connections from plating departments or acid dipping rooms. Lead pipe, of course, is used in small diameters, and is practically unacted upon by any of the commercial acids or alkalies. Unglazed porous clay pipes boiled in coal tar asphaltum have given excellent results because the asphaltum is practically unacted upon by any acids or alkalies at ordinary temperatures.—C. H. P. Problem 2,353.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST.

1,191,526. July 18, 1916. **Process of Coating Wire with Metal.** G. L. Meaker, Joliet, Ill.

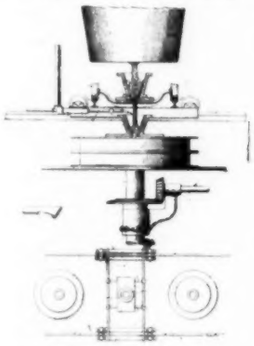
This process is especially intended and adapted for coating iron or steel wire with zinc or spelter commonly known as galvanizing.



In this process the "green" wire or wire as it comes from the drawing operation, as shown in cut, is cleaned to remove any oxidation products or scale formed in the drawing operation by pickling and washing and is then fluxed, all these operations as well as the drying of the wire being performed before the annealing operation. The latter immediately precedes the coating with metal and is so performed with relation to that step that no opportunity is afforded for the acquisition of oxids or scales by the wire. The wire is annealed at about the usual temperature of say 1,300 deg. F. and in order that the flux which has previously been applied shall be unaffected by the high temperature of the annealing step, a flux is employed which has a boiling point above the annealing temperature and is also stable thereat.

1,192,044. July 25, 1916. **Casting Apparatus and Process.** J. C. Davis, Hinsdale, Ill.

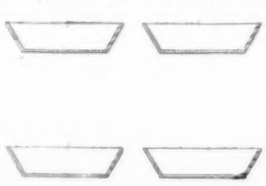
The present invention relates to the art of casting metal and to means for introducing a hardening or other modifying element into the molten metal before it flows into the mold, and has special reference to the provision of improved means, as shown in cut, whereby the admixture and distribution of the modifying element may be regulated and determined with nicety, to the end that not only a homogeneity of metal throughout the casting, or certain parts thereof, may be secured but also that the repeated reproduction of a run of castings of like composition may be attained.



The principal objects of the invention are the provision of improved apparatus for the present purposes, which will most uniformly and thoroughly mix the molten metal and the modifying element, and do so more fully and completely than had heretofore been done in any manner known to me, and do so more effectively than it has been possible to do it by pouring of the modifying element into or adjacent to the stream of molten metal as it enters the gate of the mold.

1,192,945. August 1, 1916. **Process of Separating Metals.** A. H. Sherwood, Oroville, Cal.

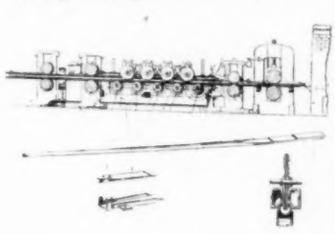
This invention relates to a process of treating pulp, black sand; concentrates and other refuse materials for the separation therefrom and recovery of precious metals, such as gold, platinum, palladium, osmium, iridium, ruthenium, rhodium, etc., the object of the invention being to provide a process of treatment whereby the recovery of a maximum amount of metals of the character described from even low grade material may be rapidly and economically performed.



The accompanying drawing shows conventionally certain instrumentalities used in the performance of the invention.

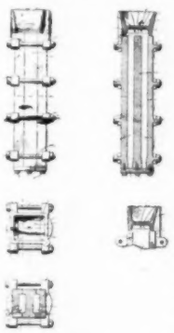
1,192,410. July 25, 1916. **Apparatus for Welding Tubing.** W. C. Frick of Deal Beach, N. J.

This invention relates to improvements in apparatus for welding tubing such as shown in U. S. Patents Nos. 989,497, 1,005,764 and 1,005,765. In the aforesaid patents there was shown apparatus for producing tubing by one continuous and progressive method, starting at the point where the metal leaves the rolling mill heating furnace and ending with the finished product in the shape of welded tubing. In the apparatus shown in the aforesaid patents, there is employed a succession of heating devices, the first patent referred to showing both gas and electrical heating devices, and the other two patents showing only electrical devices. With these heating devices the heat remaining in the skelp after the rolling thereof is augmented by heating the edges of the tubing at a plurality of places along the path of the tube, until said remaining heat, supplemented by the additional heat, raises the edges of the formed tube, successively and progressively until a welding heat is reached, as is shown in the cut.



1,192,919. August 1, 1916. **Ingot Mold.** Charles W. Lummis, Worcester, Mass.

This invention relates to ingot molds and more particularly to an improved form of mold which permits a plurality of metal ingots to be poured simultaneously.



In the metal sheet, wire and tube industry, it is customary to cast brass and similar alloys into bars or rods of comparatively small cross section and to roll or draw these bars or rods while cold to the desired sizes. The castings or ingots ars usually made one at a time in metal molds, the molds being formed of plates held together by bands and wedges which are removed after the castings have set to allow them to be taken out of the molds. In some cases permanent molds have been used, the bottoms of these permanent molds being provided with plugged openings so that after the castings have set, the plugs may be removed and the castings pushed out through the tops of the molds. This is an undesirable construction as it is difficult to make the plugs fit properly, the result being that fins are formed on the bottoms of the castings so as to cause them to bind in the molds and make them difficult to remove. It is desirable to pour the castings or ingots in permanent molds in order to save the labor of dismantling and reassembling the molds after each pouring.

One object of this invention, therefore, is to provide a permanent ingot mold so constructed, as shown in cut, that the ingots may be removed therefrom without opening or dismantling any part of the mold.

1,194,101. August 8, 1916. **Composition of Matter to be Used for the Welding and Soldering of Different Articles Constructed of Aluminum Only.** Robert Lee Weatherford, of Fort Worth, Texas.

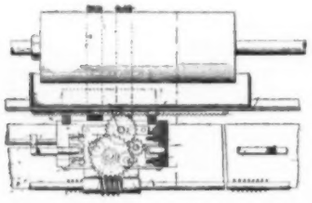
The composition consists of the following ingredients, combined in the proportions stated, viz.:

Aluminum	1 part.
Lead	1 part.
Block tin	2 parts
Zinc	2 parts.
Commercial bismuth	1 part.
Antimony	1 part.

These ingredients are to be thoroughly mingled after being heated to a heat of seven or eight hundred degrees Fahrenheit, at which heat the ingredients melt, by agitation. The different ingredients after being melted and thoroughly mingled by agitation and while still in the melted form is treated five times with sulfuric acid of strength sixty-six per cent. pure, the acid being poured into the composition to purify the same; the acid after evaporation leaves the dirt and sediment in the composition floating on the surface, which dirt and sediment is skimmed leaving the composition pure and clean and ready to be poured into molds or forms to suit the manufacturer.

1,193,400. August 1, 1916. **Reversing Mechanism for Copper-Roller-Polishing Machines.** Nicholas Laudiers, New York, N. Y.

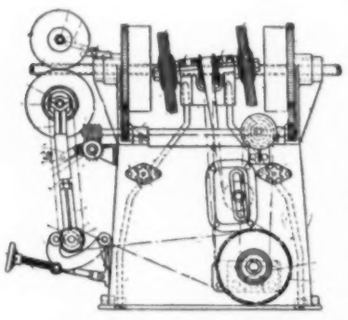
This invention relates to new and useful improvements in apparatus for polishing copper rollers for engravers' and photoengravers' use and consists essentially in the provision of means for reversing the movement of the carriage carrying of polishing or grinding stone while the driving shaft is operated continuously in one direction.



The invention comprises further various details of construction, combinations and arrangements of parts shown in the accompanying drawings.

The patent covers: An automatic reversing means for machines for polishing copper rollers, comprising, in combination with a frame, a driven shaft, a stationary rack bar upon said frame, a movable frame adapted to carry a polishing block, a plate projecting from said movable frame, a carriage mounted upon the plate and having an independent movement thereon, intermeshing gear wheels journaled upon said carriage, a worm wheel splined to the driven shaft and in mesh with one of said intermeshing gear wheels, said carriage having apertured spring-pressed bosses mounted upon said driven shaft, a gear wheel journaled upon the movable frame in mesh with said rack bar, bosses mounted in threaded apertures in said plate, spring-pressed locking members movable within said bosses and having L-shaped ends for engagement with slots in the plate a stationary cam mounted in the path of one of said locking members, an adjustable cam in the path of the other of said locking members, and a screw mounted in a projection of the adjustable cam.

1,193,453. August 1, 1916. **Polishing Machine.** Louis H. Brinkman, of Glen Ridge, N. J., assignor, by mesne assignments, to Baltimore Tube Company, incorporated, a corporation of Virginia.



The invention relates to improvements in polishing machines.

One of the objects of the improvement is, the providing of a polishing machine, as shown, in cut, to automatically feed and polish regular or irregular bars, tubing and bends.

A further object of the invention is the providing of a machine having an automatic longitudinal feed for a rotating body both before and after a grinding or polishing process.

A further object of the invention is the providing in a grinding and polishing machine of grinders flexibly and adjustably mounted and driven to accommodate irregular surfaces and bends fed through said machine.

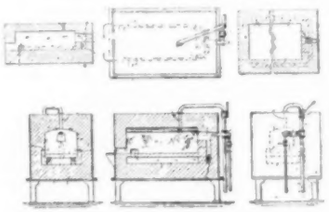
A further object of the invention is the provision of means of adjustment of the operative grinders and polishers, in a polishing machine, relative to work fed through said machine so that the cut or finish marks shall be longitudinal or at any other angle desired on said work.

1,192,670. July 25, 1916. **Hardness Testing Apparatus and Method.** Ralph W. E. Moore and Henry R. Edgecomb, of Wilkinsburg, Pennsylvania, assignors to Westinghouse Electric and Manufacturing Company, a corporation of Pennsylvania.

This invention relates to apparatus and methods for determining the relative hardness of metals and other materials, and it has special reference to hardness-testing methods that depend upon forming surface indentations in the material to be tested and determining the ratio between the areas of such indentations and the pressure necessary to form them.

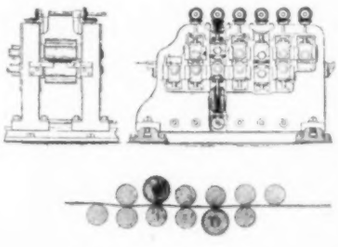
1,193,824. August 8, 1916. **Furnace.** W. S. Rockwell, New York, N. Y., assignor to W. S. Rockwell Company, of New York, N. Y.

The object of the present invention is to furnish a particular means of circulating the heated gases repeatedly through the heating-chamber of the furnace so as to secure a most complete mixture of the previously heated gases with the newly ignited gases, and a complete combustion of all the gases before they are discharged from the heating-chamber. In the present invention this means consists of a fluid fuel-inlet, as shown in cut, through which burning fuel is projected into the heating-chamber at a high velocity, and the said inlet is utilized as an injector to draw some of the previously heated gases from the heating-chamber and mingle them thoroughly with the newly ignited gases in said inlet, so that when discharged again into the heating-chamber the previously heated gases may undergo another combustion and impart to the chamber as much as possible of the heat which they contained.



1,194,617. August 15, 1916. **Metal Scalping Machine and the Like.** Edward O. Goss, of Waterbury, Connecticut, assignor to Scovill Manufacturing Company, of Waterbury, Connecticut, a corporation of Connecticut.

This invention relates particularly to machines of that class used for removing the scale or oxidation from brass plates after they come from a rolling mill and generally known as scalping or overhauling machines. The invention is applicable, however, to machines for handling other metal, and generally to machines for scraping, clearing or otherwise cutting the surface of metal sheets or bars.



The special object of the invention is to hold the metal sheet or bar firmly and in proper position during the scalping or other cutting operation, thus assuring uniform action on the metal and preventing all looseness or chattering of the plate or bar during scalping, and this result is secured by the use of feeding rolls arranged out of line longitudinally of the metal feed, as shown in cut, and so as to tend to bend the plate or bar over the pressure roll which co-acts with the scalping roll during scalping, and thus press the plate or bar against the pressure roll to hold it firmly during scalping.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST.

ACID-PROOF MASTIC FOR FLOORS AND TANK LININGS

By Daniel T. Pierce, Barber Asphalt Paving Company, Phila., Pa.

Floors and tank linings which are subject to the action of vitriol, nitrol and sulphuric acids and other similarly destructive agents, are a trying problem in many industries. In The Metal Industry for June, 1916, it is pointed out (in reply to an inquiry asking for the best way of making a concrete floor secure against the ravages of oil of vitriol and nitric acid) that "concrete floors have proven a distinct failure for plating rooms, as they are rapidly acted upon by mineral acids, especially when partly diluted."

To provide an acid-proof material which can be laid monolithically and which will be plastic without being soft, there has been devised an acid-proof mastic. This is manipulated in the same manner as ordinary mastic flooring which has been used for a great many years in abattoirs, cold storage rooms, packing houses, hotels, bakeries, station platforms and in fact wherever the requirement is for an even, waterproof, sanitary, lasting floor covering.

Three ingredients enter into mastic floor construction, namely, mastic block, asphalt flux and mineral aggregate—sand and gravel. Mastic is supplied in cylindrical blocks consisting of dust and highly cementitious solid but plastic bitumen. These blocks are made by combining Trinidad Lake Asphalt and pulverized limestone. The blocks are melted, a suitable amount of flux is added and this is then combined with a mineral aggregate and spread to a depth of 1½ to 2 inches.

The difference between an acid-proof and an ordinary mastic is simply that in place of limestone dust there is substituted fine mineral matter which is not attacked by acids. Material of the latter description is perfectly suited as a floor covering where, among other requirements, resistance to the effect of acids is a necessity. As compared to any other floor covering acid-proof mastic also has the advantage of being free from cracks, seams or any unevenness. In a multiple-unit floor there is always more or less opportunity for dirt and liquids to collect in depressions between the units of which a floor is composed.

There is no difficulty in securing successful acid-proof mastic floor covering if the proper materials are used and skilled labor is employed in making and handling the mastic mixtures. Poor workmanship is likely to result in porous spots through which acid solutions can percolate to the underlying support, in which case the results will be disastrous whether the underlying floor is of concrete or wood. It should be added that mastic is very successfully laid over wooden floors as well as concrete floors.

In the note published in The Metal Industry it is advised that a floor be prepared by combining asphalt mixed with coal tar. Such a mixture in the opinion of experts is not to be recommended because of the shortcomings of coal tar as a stable material and because coal tar does not resist acid solutions as well as does straight asphalt. This is a matter of inherent quality, and combining coal tar with asphalt reduces the efficiency of the latter. And this is an important factor, for if the filler in a multiple-unit floor is not 100 per cent. efficient the failure of the floor is a foregone conclusion, since any leakage is fatal and failure of the filler is unavoidably a 100 per cent. failure.

An interesting application of acid-proof mastic is found in the immense plant of the Chile Exploration Company, in Chuquicamata, Chile. This company's copper ores are handled by sulphuric-acid leaching and electrolysis. After crushing, the ore is put into huge concrete tanks, 15 ft. in depth and from 120 to 150 ft. square, and subjected to the action of a 10 per cent. solution of sulphuric acid for 24 hours. The solution containing the copper is then put through another proccess for extracting chlorine and afterwards passes to the electrolytic tanks. There the copper is deposited and the remaining solution, in which the sulphuric acid is regenerated, is returned to the leaching tanks. After a number of experiments carried out at the research laboratory of the American Smelting and Refining Company, Maurer, N. J., it was found that the only satisfactory lining for the Chile leaching tanks was an acid-proof mastic especially prepared for this purpose with Trinidad natural lake asphalt by experts of The Barber Asphalt Paving Company. The experience gained in the course of the copper and asphalt company tests was invaluable in the development of acid-proof mastic for a variety of purposes in addition to the lining of leaching tanks.

ACID-PROOF FLOOR COVERING FOR PICKLING AND PLATING PLANTS

By Kenneth Seaver, Harbison-Walker Refractories Company Pittsburgh, Pa.

In any practice, employing acids and other corrosive liquids in the process, there has been an urgent need of a suitable flooring material. The difficulty has been that such materials are lacking in their ability to resist the action of the liquids which frequently are spilled on the floor, or, possessing the necessary property of resistance to the corrosive liquids they are either too expensive or incapable of enduring the severe mechanical wear.

Two materials used in conjunction which have now been in service in a number of plants, giving excellent results used as a protective floor covering are a highly acid resistant tile and adherent filler manufactured by the Harbison-Walker Refractories Company, Pittsburgh, Pa. These are known as "Duro Acid Proof Tile" and "Duro." The "Duro Acid Proof Tile" is a dense vitreous and non-absorbent material of exceptional physical strength and hardness. Although extremely hard and vitreous it is not brittle and withstands shock and abrasion to a remarkable degree. "Duro" tile is also highly refractory which is a desirable property for many purposes.

The particular feature of an acid proof floor made of "Duro" tile is the "Duro" used in laying the tile. "Duro" is a very finely pulverized white insoluble material consisting of a combination of Silica, natural minerals and artificial compounds. Very hard and impervious joints are secured with it. Used with the "Duro" tile, "Duro" makes an extremely strong joint, practically forming a monolith with the tile. In a number of instances, the "Duro" tile set together with the "Duro" when placed in a testing machine, pulled apart in the body of the tile instead of breaking at the joint. "Duro" as well as the tile is insoluble in the mineral and organic acids under practically all conditions at working temperatures.

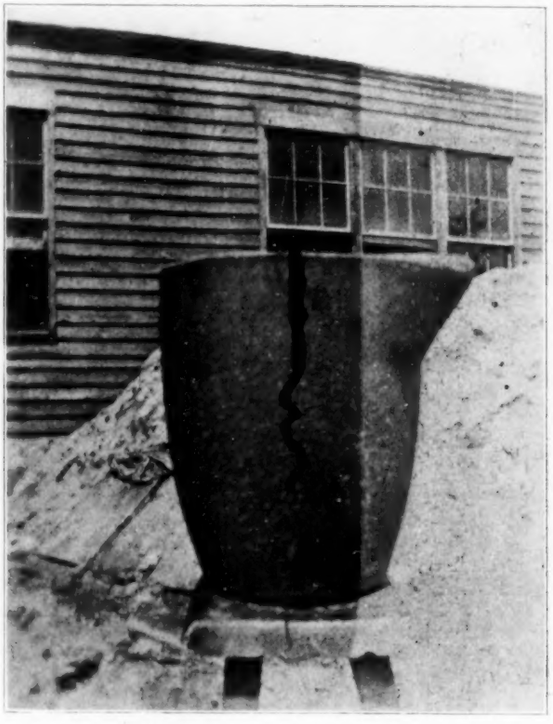
The standard "Duro" tile 9 x 4½ x 2¼ inches is a convenient shape for laying a floor covering. In practically all cases they are laid on edge making a 4½-inch covering. The laying of the tile with "Duro" in covering a floor is easy and inexpensive. With this type of floor the proper drainage is also readily provided for. These same materials are also being used very successfully on a large scale for the construction of acid vats and tanks, acid towers, linings, etc. The cost of "Duro" in comparison with other acid-proof materials and its durability and permanency make its use economical.

ALLEN SOLDERING SALTS

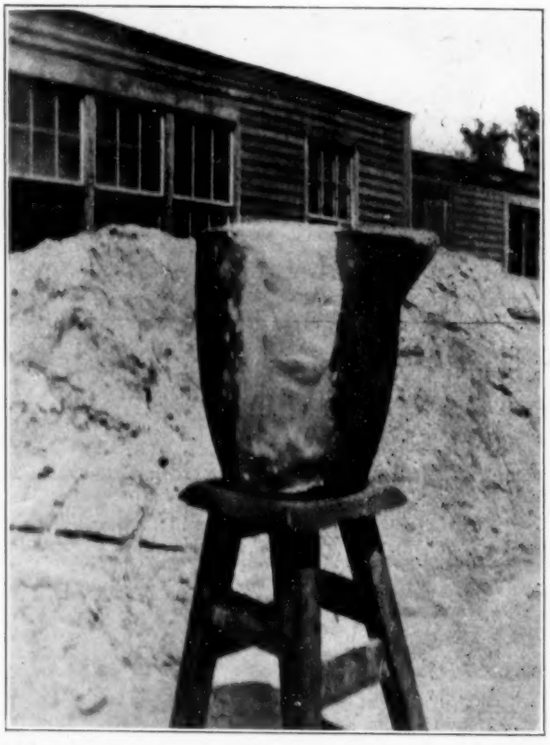
The L. B. Allen Company, Inc., Chicago, Ill., is experiencing a growing demand for their Allen soldering salt which is a material that is used for soldering any kind of work and which is put up in granular form. When wanted for use these salts are merely dissolved in water which makes a liquid flux. The strength of the solution may be increased or lessened as need arises.

SAVING A CRUCIBLE

The pictures on this page and the one following practically tell their own story. A mere recital of the facts regarding this case of crucible recovery is all that is necessary. As can be seen by referring to the pictures, Figs. 1 and 2, the crucible, a No. 125, used in a Monarch Engineering & Manufacturing Company's tilting non-lift-out crucible furnace, was cracked on the first heat in melting pure copper. The accident took place at the plant of the Aluminum Castings Company, at Fairfield, Conn., of which W. R. Mample is superintendent. Mr. Mample decided to see what could be done by patching the crucible. He selected the refractory material "Hytempite," sold by the Quigley Furnace Specialties Company, New York, N. Y. The cruci-



FIGS. 1 AND 2. SHOWING BOTH SIDES OF THE NO. 125 CRUCIBLE THAT CRACKED ON THE FIRST HEAT.



FIGS. 3 AND 4. SHOWING HOW THE CRUCIBLE WAS MENDED WITH "HYTEMPITE."

ble as shown in Figs. 3, 4 and 5 was well plastered with "Hytempite," both inside and out. The method of applying the "Hytempite" is graphically shown in thesketch Fig. 6. The black portions shown in Fig. 6 are the layers of "Hytempite." The size of the crack was favorable for the making of a strongly anchored patch. This patch held so that when the crucible

FIG. 5. SHOWING THE INSIDE OF THE MENDED CRUCIBLE.

finally leaked it did so down at the bottom of one side. After the crucible had been dried out thoroughly it was replaced in the fire and lasted for ten heats before it finally gave out and could not be reheated.

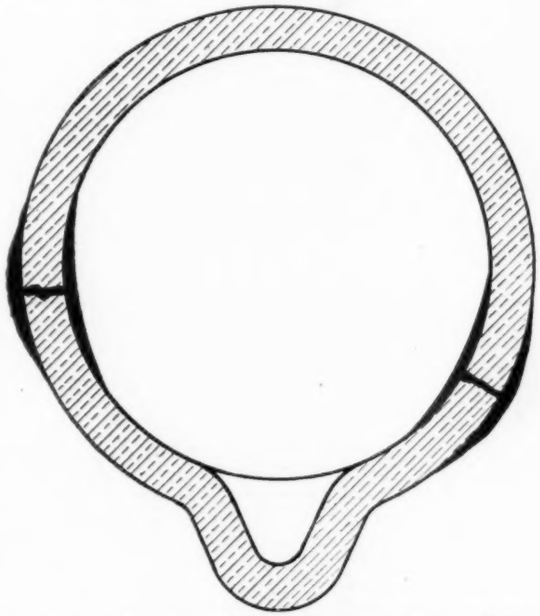


FIG. 6. SHOWING HOW THE HYTEMPITE WAS APPLIED.

Now let us see what this simple operation did in the matter of cost reduction. The crucible cost originally 16 cents per number, making the outlay for it $20. Had it been discarded when it cracked, as shown in Figs. 1 and 2, the cost per pound for the melt of 350 pounds would have been practically *6 cents per pound.* It gave *ten heats* after mending, or a total of 3,850 pounds of metal; it lost no metal on the final heat, for its entire life. Thus by using 25 cents' worth of "Hytempite" we have reduced the metal melting cost ten times, or a cost per pound

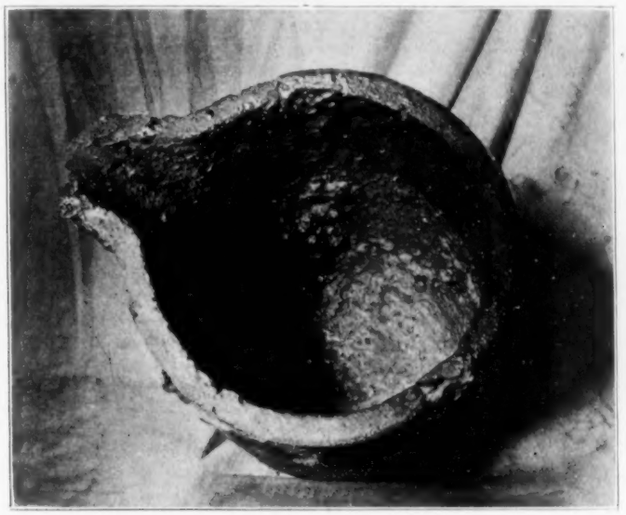


FIG. 7. SHOWING HOW THE CRUCIBLE LOOKED AFTER IT HAD RUN FOR ELEVEN HEATS.

of nearly *half a cent!* Mr. Mample, in talking of the experiment, said that he believed it was practical to coat the crucibles with "Hytempite" before putting them into the furnace and thus prolong their lives. In the case of pit fires all that would be necessary to look out for would be the use of proper fitting tongs. Fig. 7 shows the crucible after it had been used for eleven heats. This crucible is now at the office of the Quigley Furnace Specialties Company, 26 Cortlandt street, New York, N. Y., where it may be inspected.

RESISTANCE MATERIALS

The Electrical Alloy Company, manufacturers of resistance wires and ribbons, Morristown, N. J., whose products have been individually described from time to time in THE METAL INDUSTRY now announce that their line of such materials is extraordinarily complete. The company is now prepared to furnish any of the metals described below in wire or ribbon form, in coils, on spools or cut to straight lengths and they will also be pleased to send samples.

Calido—A nickel chromium alloy, replacing "Nichrome," for electrically-heated devices. Specific resistance 600 ohms per mil. foot, temperature co-efficient .00019 degs. Fahr., melting point above 2,800 degs. Fahr.

Calido Special—A nickel chromium alloy, replacing "Excello," for use in electric ovens, electric furnaces and other applications where continuous high temperatures are required. Specific resistance 565 ohms per mil. foot, temperature co-efficient .00009 degs. Fahr., melting point 3,000 degs. Fahr.

Ideal—A copper-nickel alloy, replacing "Constantin" and Ia la," for electrical instruments and other devices where extreme accuracy, reliability and permanency are required. Specific resistance 296 ohms per mil. foot, temperature co-efficient .0000028 degs. Fahr.

Tarnac—A nickel-Copper-Manganese alloy, replacing "Manganin," for electrical instruments.

Alloy 67—A copper-nickel alloy, replacing German silver, being permanent, non-corrosive, withstanding higher temperatures than German silver and adapted for use in rheostats, car heaters, etc. Specific resistance 290 ohms per mil. foot, temperature co-efficient .001 degs. Fahr.

Phenix—A nickel steel chromium alloy. For use in elevator controllers, arc lamps, rheostats and heavy duty resistances. It replaces straight nickel-steel alloys such as Krupp, Superior and

Climax and is much better than these and all other nickel-steel resistors in its ability to withstand oxidation and corrosion.

Spark Point Nickel—A nickel manganese alloy, replacing "Meteor," for use in spark plug electrodes, ignition points, ignition tubes and contact points. It has a very high melting point (2,900 degs. Fahr.) and will withstand excessive heat cycles without disintegration.

Pure Nickel—Ninety-nine per cent. and over pure, for use in anchors in Tungsten lamps, supports for gas mantles, etc.

German Silver—Eighteen per cent. and 30 per cent.

Monel Metal—Stronger-than-steel, non-corrosive alloy, for use in wire cloth, screens, etc.

ELECTRIC VIBRATOR

THE METAL INDUSTRY for July, 1916, contained a description of an electric vibrator sold by the E. J. Woodison Company, of Detroit, Mich. The Woodison company have now given out some additional information regarding this machine, which is known as the "L. & A." Electric Vibrator. Following is what they say about it:

"The electric vibrator for foundry use, shown in the cut, is manufactured by the Pressed Steel Company, and has many features about it that make it superior to anything on the market today. It is small and light, but still has a blow or vibration sufficient to do the work it is intended for in the most satisfactory manner.

"As shown by the following table, the cost of operating the vibrator is practically negligable:

Size.	Weight.	Cycle.	Volts.	Amp.	Watts.	Cost Per Day in Cents.
1	2¼	60	110	.7	77	.8
1	2¼	30	110	.5	55	.55
2	2½	60	110	1.0	110	1.1
2	2½	30	110	.7	77	.8
3	3¼	60	110	1.5	165	1.5
3	3¼	30	110	.8	88	.88
4	4¼	60	110	2.0	220	2.0
4	4¼	30	110	1.0	110	1.1

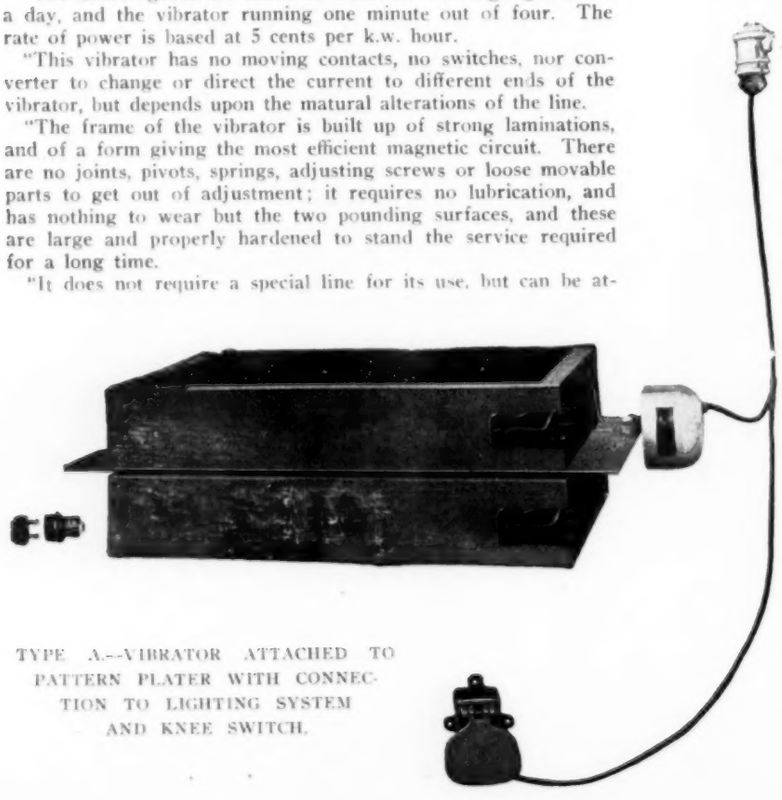
"The above figures are based on a molder working eight hours a day, and the vibrator running one minute out of four. The rate of power is based at 5 cents per k.w. hour.

"This vibrator has no moving contacts, no switches, nor converter to change or direct the current to different ends of the vibrator, but depends upon the matural alterations of the line.

"The frame of the vibrator is built up of strong laminations, and of a form giving the most efficient magnetic circuit. There are no joints, pivots, springs, adjusting screws or loose movable parts to get out of adjustment; it requires no lubrication, and has nothing to wear but the two pounding surfaces, and these are large and properly hardened to stand the service required for a long time.

"It does not require a special line for its use, but can be attached to any lamp socket, and so can be used in any part of the foundry where occasion may require it. The vibrator is made to operate on 110 and 220 volt A. C. of either 30 to 60 cycles.

"The whole is enclosed in a neat aluminum case, which keeps out all dust and prevents curious or malicious workmen or others damaging it in any way."



TYPE A.—VIBRATOR ATTACHED TO PATTERN PLATER WITH CONNECTION TO LIGHTING SYSTEM AND KNEE SWITCH.

GENERAL ELECTRIC COMPANY EXHIBIT

The following list consists of the apparatus which the General Electric Company, Schenectady, N. Y., will have on exhibition at Foundry and Machine Exhibiton at the Wigmore Coliseum, Cleveland, Ohio, September 11 to 16, 1916.

1 3,350 centrifugal compressor set, with 4 hp., 3 phase, 60-cycle, 220-volt motor.
1 5-inch blast gate.
1 P-10 oil switch with overload relays for use with 3,350 centrifugal compressor set.
1 R-28 V controller No. 333,057, with handle.
1 R-98 B controller No. 330,125, with handle.
1 R-182 controller and handle.
1 R-126 A controller and handle, No. 332,971 and CR-1,334 resistance assembled.
1 T-80 A controller No. 326,328.
1 R-178 M controller No. 331,956.
1 D.L. 1,292,689, CR-2,303 control panel and pipe frame.
1 No. 173,836 CR-1,038 motor starting switch.
1 CR-1,034 type NR 1,610 starting compensator No. 1,487,225.
1 DL-174,178 CR-2,131 K panel.
1 DL-170,091 CR-2,131 J panel.
1 DL-145,723 CR-2,131 E protective panel.
1 DL-1,893,669 CR-2,131 CP panel.
1 push button panel exhibit.
1 No. 173,035 CR-2,271 starting rheostat.
1 DL-1,695,945 CR-2,273 motor panel.
1 DL-1,699,210 CR-5,070 panel.
1 DL-1,694,333 CR-2,223 panel.
1 DL-1,680,334 CR-2,266 panel, with enclosing case.
1 No. 135,908 CR-3,134 starting rheostat.
1 exhibition rack consisting of—
1 set Dr. 819,040 pipe supports.
1 DL-1,694,509 CR-8,000 field rheostat.
1 brake and gear display with motor No. 747,092.
1 RC-13-25 hp. 230 V. motor No. 499,913.
1 motor base No. 1,178,237.
1 DL-1,686,777 CR-2,361 panel.
1 RC-12-30 hp. 250 V. motor No. 499,911.
1 RC-7½ hp. 230 V. motor No. 518,717, with conduit terminal box.
1 RC-3 hp. 230 V. motor No. 472,985, with conduit terminal box.
1 iron motor base.
1 iron motor base.
1 conduit box and switch.
2 push switches.
1 arc welding holder.
1 fuse.
3 flexible terminals.
1 miscellaneous lot of metal for welding demonstration.
1 No. 173,836 CR-1,038 switch.
1 300-ampere portable arc welding outfit complete, with welding, wire and cable.
1 stereomotorgraph machine complete.
1 stereomotorgraph machine complete.
1 AC 7½ hp. armature and parts.
1 arc welding hood.
1 arc welding table.
8 wood motor bases.
1 a frame.
1 tri-block (hoist).
1 10 x 10 x 2¾ x 7-inch Rockwood pulley.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS.

AMERICAN ELECTRO-CHEMICAL SOCIETY

At the coming convention of the American Electrochemical Society which will be held in New York September 27 and 30, one of the sessions will be devoted to "Made in America" products of the electric furnace and electric cell. These products include many of our most important staples such as copper, aluminum, abrasives, bleach and many more. It is an interesting fact that whereas other chemical industries such as the coal tar dye industry are distinctly European, the electrochemical industry is decidedly American. It is here in America where the production of aluminum was invented and put no a commercial basis. The first plant for the electrical synthesis of the elements of the air and the production of artificial fertilizer nitrate was erected at Niagara Falls, N. Y. At the Falls, also, tons of abrasives are produced in large, powerful electric furnaces. The importance of these abrasives can best be appreciated by the fact that if the supply from the Falls were to cease today, practically every mill and factory in the country would have to shut down within three months' time.

Other electro-chemical products of decided economical importance and value are graphite, phosphorus, hypochlorite of lime, magnesium, metal, carbon bysulphide, calcium carbide, hydrate of sodium, ferro silicon and other iron alloys which are indispensable to the steel trade.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

To meet the requirements of the societies who will hold meetings at the Grand Central Palace, the auditorium has had to be increased in size, so that now it will comfortably seat 500 persons. An automatic motion picture machine of the latest design will be used to display the motion pictures, many of which will be loaned by exhibitors. In many cases there will be lectures to take the audience through a pictorial tour of a plant and they will be shown machinery and processes in the manufacture of materials that, until then, had never been previously shown. Many of the films are at present being made and are expected to be finished in time to be shown at the Exposition. A few of these films are as follows: Making of Black Powder, Manufacture of Iron, Manufacture of Fertilizers, Mining and Manufacturing of Iron, Manufacturing of Silk, Making of Blotting Paper, Silver Mining, Manufacturing of Varnish, Asphalt, and one or two others not yet announced.

Two other features of the Exposition that have been added this year are a large section showing the opportunities that await the chemist in our South and known as the "Southern Opportunity" Section and a section for the "Paper and Pulp Industry" composed of materials and machinery used in the manufacture of paper and other related products.

The "Southern Opportunity" Section is an ambitious undertaking to display to our chemists, chemical engineers and capitalists the great latent wealth that awaits them in the undeveloped resources of the South. Not only will it show them these resources but will forcibly bring to their attention the debt they owe their country in return for the education and knowledge gained in its institutions of learning. It will show that the materials have formerly been shipped to foreign countries to be enhanced in value by manufacturers and returned to the original producers at a greater price.

The opening of the Exposition will be attended by many of the greatest men the country has produced. The Exposition, a product of the chemist and by chemists, will be opened by chemists—Dr. Charles H. Herty, president of the American Chemical Society and Chairman of the Exposition Advisory Committee, will make the opening address. Francis A. J. Fitzgerald, president of the American Electrochemical Society, and Arthur B. Daniels, president of the American Paper and Pulp Association, will also make addresses, after which the assembled guests will visit the exhibits.

NEW YORK ELECTRICAL EXPOSITION

Electric welding of metals will be one of the feature exhibits of the New York Electrical Exposition, which will be held in Grand Central Palace, New York City, October 11 to 21. The importance of this exhibit from an educational standpoint cannot be over-estimated, for the general public is surprisingly uninformed on this highly important process in the metal industry.

The exhibit is being arranged by the Arc Welding Machine Company, of 220 West 42nd street, New York City, and Mr. O. A. Kenyon will be in charge. The public will have an opportunity of seeing all grades of welding accomplished in metals, including structural pieces, plates and castings. Two arcs will be in operation equipped with automatic control, so that the metal cannot burn by drawing too long an arc. The length of the arc is automatically controlled so that even the most unskilled worker cannot draw it beyond the point set. A special type of self-regulating generator designed particularly for welding purposes will be used. It consists of three units, one of

PERSONALS

ITEMS OF INDIVIDUAL INTEREST.

Noel Cunningham, formerly of the Dorr Company, has opened an office as consulting metallurgical engineer at 200 Fifth avenue, New York, N. Y.

Russell C. Blakeslee, after 32 years of service in the employ of the Torrington Mfg. Company, Torrington, Conn., has resigned to take a situation with the Chase Rolling Mill Company, in Waterbury, Conn. He began his new duties September 1 and will probably move to the Brass City. Until recently he was secretary of the Torrington concern.

DEATH

John S. Browning, a well-known newspaper correspondent, died at his home in Cambridge, Mass., August 9, after a long illness. Mr. Browning was born in England and lived in this country since childhood and was educated at Webster Grammar School and the Cambridge High School, Cambridge, Mass. From early life Mr. Browning had been active in the newspaper and trade journal field. He was the Boston correspondent of THE METAL INDUSTRY for several years. He leaves his wife and a daughter.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS.

WATERBURY, CONN.

SEPTEMBER 1, 1916.

All the plants of the Naugatuck valley engaged in producing brass and copper goods are operating at practically maximum capacity and the prospects are that they will so continue for an indefinite period. With few exceptions there have been no difficulties with employees over wages or conditions the past three months and generally the production of brass goods for domestic consumption or for munitions is proceeding with speed and regularity as if the organization plans of the present had been in operation for years instead of the brief period since Europe answered the call to arms.

Never before has the brass industry been more prosperous than here at present. No summer has seen such volumes of business nor were they ever dreamed of. Responding to the remarkable demands of the times with equally remarkable power the Naugatuck Valley metal industries have again demonstrated the industrial power of this portion of the country and the genius of its industrial leaders. Not only have they kept up the pace required to meet the finicky demands of European belligerents, but they have at the same time handled an extraordinary labor problem and an unprecedented situation affecting their capacity. That they have succeeded is proven by their continued extension of business without serious neglect of domestic requirements or the demands of the future.

Those remarkable plants of the American Brass Company, the Scovill Manufacturing Company and the Chase Metal works continue to expand, to be enlarged and to be improved and all the time the older buildings are in operation with thousands of busy men and women zealously working to uphold their standards of quality and speed of operation night and day.

Not all the activity is for the upbuilding of factory walls or the setting up of machinery. Waterbury had some 80,000 people in 1914. Since then some 10,000 skilled and unskilled laborers and their families have come here and thousands more, the families of workers who have been unable to secure homes here are waiting for the day when more than just a place to sleep may be had by the new arrival. Those three great corporations have undertaken great home-building programs for the benefit of their employees and the first results have just appeared. This week saw the roofing over of the first group of new brick apartment houses being erected for the Scovill people, to be sold or leased to employees on terms within their reach. The American Brass Company also has undertaken a house building plan which will be protected within a year, and in various parts of the city the Chase interests are to set up houses which their homeless employees may occupy.

John Nolen, the famous expert on housing, made a survey of the city's needs, set forth a comprehensive report on them with numerous suggestions as to the needs and how to meet them, and the work is under way. This was done with the sanction and partial co-operation of the municipal administration through the office of Mayor Martin Scully. Rents are very high and houses very scarce.

Industrially, munitions business still seems to have the lion's share, but while it is large it is not all. Tube mills, rolling mills, plate mills, novelty shops and the smaller concerns all are enjoying great prosperity with orders plentiful and coming in regularly from domestic consumers.

One doubtful chapter is that on clocks and watches. It is apparent that there is a slump there. Great quantities of European clocks and some watches came in when the Underwood tariff law became effective and that they found a market and hurt the home market is beyond doubt. It is not here alone that this fact is apparent; look at the inroads on peaceful war plants that have been made by the contractors of munitions orders. So it is understood that the industry feels unable to promise its old time health for months, judging only by orders. It is because the foreign market of these goods was largely a European market and that is closed to it now. Some of the foremen of the Waterbury Clock Company have left its employ recently and many of its hands have drifted to the busier and more lucrative munitions factories, not only here, but also in New Haven and Bridgeport.

The new Ingersoll plant, that in which the old Waterbury watch has its great success, is busy and has upwards of 450 hands on full time, with plenty of work in sight, apparently. In Winsted, also the Gilbert Clock Company is busy, and in Bristol the clock and watch plants of the Ingraham concern are very active and have attracted some hands away from here. The Waterbury Clock Company still has its big plant in full operation and, were it not for the annoying flux of labor due to inflated wage schedules in other industries its changes would be far fewer. The Seth Thomas Clock Company in Thomaston is somewhat busier, but still below normal.

One little labor row marked the past week. There were some hot days and some 100 odd hands in the Randolph-Clowes Company's plant quit work. They stayed out a couple of days, made no trouble, although their absence caused the suspension of the entire plant, and after a slight cool wave struck town most of them returned. There has been a readjustment of conditions and some payroll changes and all seems serene there now.

Should a railroad strike occur it would not cause much difficulty here unless it continued some time. Goodly supplies of copper and spelter are on hand and fuel supplies are well provided, but there is some anxiety over the prospects.

This is not an eight-hour day district, but eight hours is the day's length in many of the plants here now where great forces of skilled hands are employed. They work from nine to thirteen hours a day, with half a day Saturday, doing a seventy-hour week, but the pay is on the "overtime scale" in many departments of the larger plants after the eighth hour, so that a seventy-hour week by the clock means a seventy-seven or eighty-one hour week on the payroll, according to whether the "overtime scale" is for five-fourths or three-halves. Perhaps the railroads can adjust matters, individually, if opportunity is presented, or a similar basis, and as Waterbury is absolutely dependent upon rail transportation, it is sincerely hoped here that the storm will blow over, or better, "blow up."

Some mention was made a few months ago of the labor necessity in this district and of the possible importation into northern states of negro labor to fill the ranks once recruited from the green labor supplies fresh from Europe. Some forces of negro labor were brought here for brass foundry and rolling mills months ago and they have stayed. Lately the New Haven railroad began importing negroes from Georgia and these are colonized on railroad property, fed by the railroad in special dining cars with food prepared by Pullman chefs. Their transportation north is paid by the railroad and after their arrival here their expenses are deducted from their wages in weekly instalments. Naturally they are easily won by offers of as good or better wages in the factories and many of them have lingered but a few brief days in the railroad lodgings, finding brass factory work quite as attractive. Before the far in Europe ends there will be a much larger percentage of black labor north of the Mason and Dixon line than ever before and for the first time the brass industries in Connecticut will find a race question on their hands. They have shown how to handle big problems in the past two years and doubtless they will handle this when the time comes, but it is interesting because it is so new.

Another extra dividend of 10 per cent. has just been declared by the Scovill Manufacturing Company, making the eighth this year.

T. B. F.

HARTFORD, CONN.

SEPTEMBER, 1, 1916.

The past month has seen more activity in the metal industries of Hartford than there has been during the entire summer. More war orders were received and more are anticipated, large factory additions were decided upon and other indications of continued prosperity were apparent.

Additions to its plant, which, with equipment, will cost approximately $200,000, will be immediately started by the Billings & Spencer Company, giving employment to 200 or more. The additions that will be built will include a new forging department which will be one of the largest and best equipped in New England.. This department will add about 50 per cent. to the present facilities. Although the company's present plant at Park and Laurel streets is about twice as large as the old factory on Broad street, the company has found it necessary to build the additions on account of the rapidity with which its business has been increasing. The company has been located in its new factory only a little more than a year. The building that is to contain the forging department will be a handsome two-story brick and steel structure. It will be 290 feet long and ninety feet wide. It will contain the heat treating department, locker room and washroom for the employees. An addition will be built to the north wing of the present plant to provide for the machine department. It will be 120 feet long and seventy feet wide, two stories high and of mill construction.

The Whitney Manufacturing Company is to erect a new factory building at the southwest corner of Bartholomew avenue and Hamilton street. Its dimensions will be fifty-eight by 112 and the addition is to be equipped with machinery and will relieve the crowded conditions in the present plant. It will be connected with the other buildings of the factory by a long, covered passageway. There are now 650 men in the employ of the Whitney Manufacturing Company and there will be an increase in the force with the completion of the new addition. An addition costing $4,000 is to be made to the company's garage.—T. C. W.

PROVIDENCE, R. I.

SEPTEMBER 1, 1916.

As has been the case for many months now, the various branches included in the metal trade industries throughout Rhode Island, continue to show a great degree of activity. There is not a plant in the state that is not being rushed to the full limit of its capacity, and which could not use many more workers, if they were available, and several of them would build additional facilities were it possible to obtain the necessary help to man new or additional machinery. War orders are reported to have been plentiful during the past month and it is understood that several concerns are negotiating for further orders. In nearly every line there is more than enough work on hand, or in sight, to keep things moving at the present top speed for the remainder of the year, at least.

The manufacturing jewelers and the allied branches, of this city, the Attleboros and other centres in this section, are showing signs of a general improvement in the present conditions and on every side are signs of happiness over the prospects for an unusually good business during the remaining months of 1916. While a few concerns report only a mediocre number of orders so far as many of the larger plants are concerned, the manufacturers are squaring away for the best season that they have had in several years. Many of the plants are advertising in the daily papers for help, but with comparatively little success.

One of the noticeable indications of increased business activities at the present time is the building of large and small additions to the different manufacturing establishments throughout the State. Several permits were issued during the past month in this city to firms which desire to add to their building equipment, and in many of the smaller cities and towns of the State new buildings are springing up about the old plants. In addition to the building that is going on, many of the plants are adding to the machinery, and several are also throwing out old machines for new ones.

One of the busiest plants in the vicinity of Providence is that of the Gorham Manufacturing Company, where a large force of men are at work on parts that are being used in the making of munitions of war. Something over a month ago a large addition to its bronze foundry department was erected and equipped with special machinery for this work and since then the size of the department has been increased until it is now nearly double its first dimensions. Here, a day and night force has been maintained for more than a year. While the company does not admit that it is engaged in the manufacture of munitions of war, it does not deny that the products of this particular department of the plant may be and probably are used in the making of munitions elsewhere. However, the plant has been considerably enlarged, a day and night force maintained, but it is understood that new machinery placed in the department has all been of such a character that it can be utilized in the regular work of the corporation.

Ten years exemption from taxation has been granted by the Town Council, of East Providence, to the Abrasive Tool Company on the plant which the concern is to erect at once on Dexter street, opposite the Eastern Bolt & Nut Works. The first building will be 150 feet long and 50 feet wide, with an ell 25 by 30 feet. More than $20,000 worth of machinery will be installed and employment of at least 50 skilled mechanics is expected to start with. When the entire range of buildings is completed, fully 700 hands will be employed. The initial one-story building will be so constructed as to permit additions from time to time. Grinding machine tools will be the principal product of the new concern, of which Frank N. Macleod is the treasurer.

Work has been commenced upon a new factory in Auburn, which, when completed, will house the three plants now conducted by the United Wire and Supply Company—two of which are at present located in Pawtucket and the third on Summer street, this city. The new factory will be on Elmwood avenue, near the plant of the Standard Machinery Company, where the concern recently acquired six acres of land. The building will cost approximately $1,000,000 and about $50,000 worth of new machinery will be installed in it as soon as it is ready. The firm manufactures plated wire such as is used by manufacturing jewelers; brass tubing and a special line of metal parts for automobiles. The new building was made necessary by the increased business demands which are being made upon the concern.

H. J. Astle & Company have been busy making the following installations of Boland systems: J. T. Smith, engraver and engine turner of this city, a polishing bench and dry dust collecting system; the Smith-Patterson Company, Montreal, a pressure blower; DuPaul-Lockhart Company, a new lens company at Southbridge, Mass., a blower; W. O. Hickok Manufacturing Company, of Harrisburg, Pa., a blower.

The New England Ventilating and Heating Company has just completed the installation of an emery dust conveying system at the plant of the American Emery Wheel Works, on Angell street, this city.

The Brown & Sharpe Manufacturing Company has commenced the erection of a new building in the rear of Leland and Promenade streets, this city. The structure is to be 72 by 170 feet, one story high and to be constructed of brick and steel.—W. H. M.

BUFFALO, N. Y.

SEPTEMBER 1, 1916.

The metal trades in this market are moving fairly brisk, and they would be more brisk were it not for the shortage of labor, which has almost become a chronic state of affairs. The consumers of the local non-ferrous products, everywhere, claim that, owing to the scarcity of labor, their own output capacity is being curtailed. One encouraging feature in this market is that prices are advancing to a point where some of the local business men are able to make a fairly decent profit. Also, collections are very much better than they were a month ago. It seems as though the iron-clad bands are beginning to unloosen on some firm's coffers.

The hot weather which set in toward the end of last month has affected the output capacity of the local foundries very materially. Everywhere the men are complaining because of the intense heat. As a result, the foundrymen are not urging their men to work as hard as formerly. They believe that an ounce of prevention is better than a pound of cure. In other words, they fear that urging the men to work too hard under such trying conditions is very apt to develop into a mountain of accidents; therefore, they prefer to slow up for the time being.

All local foundrymen are very optimistic about the future trade. In fact some of them have already booked enough orders to keep them busy until well after the Christmas holidays.

The National Bronze Company reports business as being unusually good. They look forward to a very prosperous winter and fall trade.

J. H. Edwards, of North Tonawanda, N. Y., has become secretary of the Bridgeport Crucible Company, of Bridgeport, Conn., the largest makers of crucibles in the United States.

There is no noticeable or marked increase of business in the rolling and finishing mills. Business continues to run along in the same old brisk manner, which it has for the last year.

The North Buffalo Hardware & Foundry Company are making a large addition to their present foundry.

The Lumen Bearing Company are building two large storage sheds to their plant in East Buffalo.

The Unique Brass Foundry Company is being rushed to capacity with orders which will keep them busy throughout the remainder of this year.

The electroplaters report an increase in their volume of business. Prices are said to be better, and collections are good.

The Buffalo Metal Goods Company are making a large addition to their plant in North Buffalo.

A. G. Fries Plating Company reports that they received a contract from the street department of the City of Buffalo to galvanize 400 street signs. They report that prospects for the future are very good.

The Washington Plating Works report that their volume of business has increased very materially during the last month. They just booked a large order from both the Herschell-Spellman and the Curtiss Aeroplane Company. Most of the work calls for the copper plating of cylinders.—G. W. G.

NIAGARA FALLS, N. Y.

SEPTEMBER 1, 1916.

Trade in this market has improved in certain lines during the last month and judging from present indications this brisk trade will undoubtedly continue throughout the winter months. This spell of prosperity which now prevails has no equal except when one turns the calendar back a number of years. Everyone seems to be of an optimistic turn of mind. The forthcoming presidential election seems to have little or no effect on either their optimism or upon trade generally.

The only thing which might dampen the fires of the local metal men's optimism is the growing labor problem. Labor is a very scarce commodity. And if one is able to judge accurately from present indications it is very apt to become more so in the near future.

Some time ago it was announced by the Hon. G. G. Ferguson, Canadian Minister of Lands, Forests and Mines that both the International Nickel Company and the British-American Nickel Company would build refineries in the province of Ontario. In fact, for some time previous to this announcement the Canadian Government has been insisting upon the establishment of a nickel refinery in the province. A part of the work of the Nickel Commission has been to solve what has hitherto been an unsolved problem, that is the refinement of Ontario ores within the Province. The result of the work as done by this commission, the Government was able to announce was that nickel would be refined in Ontario just as soon as the necessary plant could be erected.

And now, it is announced that the British-American Nickel Company is about to begin the development of power on the Wahnapotae River near Sudbury, for use at their smelter and refinery which are to be erected at the same time. In refining they will use a new electrical process. This process it is said has been tried in Norway where it has been found to be a success.

The International Nickel Company of New Jersey has bought two hundred acres of land at Port Colborne, fronting on Lake Erie, just east of the Welland Canal, where a large refinery will be built. The land was bought from Messrs. D. McGillvary, D. Winn, G. Ramey, Thomas and Philip Bush and Mrs. Kilberer at a price of $300 an acre. The plant when ultimately completed will cost in the neighborhood of $4,000,000. The reason for selecting this site, it is said, is due to the fact that Port Colborne is near the states of Ohio and Pennsylvania from which states they will receive their supply of coal. Fuel being a big element in the refining process, makes it necessary that they locate as close as possible to the supply of coal. The original plan was to locate the plant at Sydney, N. S. It is estimated that this plant will have a capacity sufficient to refine all the nickel required by Great Britain.

It is said that the establishment of these two plants in the Province will mean an immense investment of capital, the employment of a large amount of labor, with the consequent distribution of vast sums in the form of wages to working men, and they will for all time allay fears of even the most nervous and skeptical persons that the interests of the British Empire and her allies will not be fully safeguarded in the matter of armament and ammunition.

The Niagara Metal Company, of North Tonawanda, N. Y., took over the plant of the Farr Manufacturing Company during the last month.

At the joint annual outing of the employees of the Spirella Company's plants at Niagara Falls, N. Y., and Niagara Falls, Ont., to Crystal Beach, nearly 700 employees were the guests of the firm. They went in special trains from Niagara to Buffalo and thence by boat to Crystal Beach. H. W. Gilbert, superintendent of the Canadian plant, was highly honored by the employees of the branch on August 14, his 70th birthday.

The Titanium Alloy Manufacturing Company is unusually busy. They have booked orders which have mounted into the six figure column and which will keep them busy until long after the first of the year. Their new machine shop and chemical laboratory, which will cost $30,000, is well under way. They expect to occupy their new addition within sixty days.—G. W. G.

ROCHESTER, N. Y.

SEPTEMBER 1, 1916.

There is little change in trade conditions in this market over those which were last reported. If there is any change, it is an increased volume of business and prices, and, judging from the recent Federal Census report, Rochester is growing rapidly as a non-ferrous metal center. Its activities along these lines have increased to a very marked degree since 1910.

The question of labor is becoming more acute and serious each day. This problem is the most trying one that the men have experienced in a great many years. Then on top of this scarcity of labor, a strike has been called among some of the workmen.

The Gundlach-Manhattan Optical Company are building a fireproof brick addition to their present factory. The new addition, which is to cost $2,000, will be used for storage purposes.—G. W. G.

COLUMBUS, OHIO

SEPTEMBER 1, 1916.

The metal market in Columbus and central Ohio territory has been rather active during the past month. Demand for all varieties has been good and the volume of business is generally satisfactory. While the volume is not as good as it was several months ago, the present state of affairs is believed to be only temporary and a stronger demand is anticipated in the near future. The supply is generally good and there is no shortage of any metals in this territory.

Buying is being done along rather broad lines. Metal using concerns are trying to accumulate stocks ahead, afraid of the consequences of a general railroad strike in case it is called. As a result of that movement the demand is rather better than formerly. The consumption of metals by all concerns is as good as in former months.

Brass is one of the strongest points in the market. Red ingot is quoted at 20 to 21 cents. Yellow ingot is selling around 16½ cents. Copper is also firm in every way, being quoted at 22½ to 23 cents. Aluminum is strong at 45 to 46 cents. Babbitt is unchanged from the previous month. There is an extraordinarily good demand for type metals of all kinds. Tin is moving fairly well at 38¼ to 39 cents, while zinc is quoted at 9¼ to 10 cents per pound.

The Metals Machining Company of Dayton, Ohio, has been incorporated with a capital of $10,000 by Charles F. Dye, M. A. Sieg, M. W. Cole, H. M. Haller and George W. Ozias. J. W. L.

CLEVELAND, OHIO

SEPTEMBER 1, 1916.

Coincident with the establishment of a record number of new metal industry plants and those allied to the trade for one month during August, comes the statement of leading interests in the industry in Cleveland that the year 1917 will be as phenomenal in its production and activities as has been the present year. This statement is based upon the tremendous number of orders placed with iron and steel mills in the northern Ohio territory than can keep these plants going right through the next twelve months without additional business being placed. The movement in the iron and steel branches of the industry are reflected all along the line in other directions. All metals and products are in active demand never before seen at the tail end of summer. Of special significance is the increasing domestic business, contrasting with the heavy export movement noted since soon after the outbreak of the European war.

Varied interests in this district will consume the products of the metal shops of Cleveland, but paramount is the automobile industry, many automobile plants and accessory establishments having decided to make Cleveland their headquarters.

The Ben Hur Motor Company, which has completed organization, will erect a $300,000 automobile plant on a nine-acre tract at Willoughby. The Jordan Automobile Company is preparing to build a similar factory on the outskirts of the city to the east. In the same neighborhood the Dann Products Company, which will produce a metal containing graphite for use in bearings, is about to erect a building. Buildings also in the same vicinity have been acquired by the Torbensen Gear and Axle Company, and this firm will increase its capacity by the erection of another unit.

Site for a large aluminum castings plant has been taken by E. E. Allyne, of the Allyne-Ryan Foundry Company and the Allyne Brass Company in the Nottingham district. To take care of its increasing business, first steps toward developments which will be carried on for three years have been started by the American Stove Company, these improvements to include many new buildings in the mid-town manufacturing section. In this section the Electric Controller Manufacturing Company is erecting a $150,000 structure.

One of the most significant developments to the metal industry during the month has been the announcement that the Abbott-Detroit Company proposes to remove its plant from the Michigan city to Cleveland. A $200,000 plant will rise on a recently purchased tract in the East End where a special type of automobile will be made. The Bondy Manufacturing Company, making automobile radiators, will occupy a new building in the heart of the East End manufacturing district. The Acme Manufacturing Company takes more land near the Belt Line Railroad for a factory to take care of its screw machinery output.

One death is to be recorded during the month in the metal industry. Howard Macrum, general superintendent of the Otis Steel Company, expired suddenly at his home here, following an attack of acute indigestion. He had been with the Otis Steel Company for thirteen years, and formerly was connected with the National Tube Company at McKeysport, Pa. He was a member of the Chamber of Commerce and the Shaker Heights Club. Burial was at Pittsburgh. C. C. C.

CINCINNATI, OHIO

SEPTEMBER 1, 1916.

One of the most serious handicaps with which the machine-tool industry is working in this vicinity, as well as elsewhere, is the difficulty of securing a rapid movement of freight, both in- and out-bound. Concerns without unusually good facilities for securing raw materials are in the majority, and they are hampered in getting shipments of goods of all kinds needed in their work, especially, of course, metals; while the difficulty in getting cars to move shipments out is becoming more and more pronounced. As reports from traffic authorities indicate that the car shortage will increase, rather than diminish, with the advance of the season and the normal increase in activity of business, it is almost certain that the fall season will witness even greater trouble in moving shipments. That there will be plenty of business for the various branches of the metal trades here for some time to come is quite certain, as operations in the big machinery and tool plants continue with undiminished activity. An official of one of the larger tool concerns is quoted as stating recently that it has orders ahead for five years to come, with more business constantly coming in to add to that remarkable total. All of the shops which have been able to secure the necessary working forces are running 24 hours a day, usually with two long shifts, and this shows convincingly the pressure under which the trade is working. The demand for all of the metals, especially copper for bronze and brass making and the alloys themselves, is naturally very strong, and in many cases substitutes, such as babbitt metal, have been used on account of the impossibility of securing those based on copper. Outside foundries have all that they can handle, and the foundries connected with the big machine-tool and other plants are in the same situation. The activity in the metal trades and the industries causing this activity bids fair to continue for a long time, in view of the future business already on hand.

H. H. Suydam, president of the Cincinnati Manufacturing Company, and in that capacity one of the most prominent figures in the metal industry in this vicinity, has presented to the Business Men's Club a handsome bronze tablet, designed for use in the new home of the club, which is to be erected during the coming year. Lincoln's Gettysburg address is inscribed on the tablet, and a relief bust of the martyred president appears above the inscription. The tablet was designed and produced in the company's plant.

K. C. C.

DETROIT, MICH.

SEPTEMBER 1, 1916.

But little change is noted in conditions relative to the brass, copper and aluminum business within the last four weeks. So many companies are working on automobile contracts, with orders booked ahead for months, that little change is expected to occur for a long time. As a whole, business is booming in all these lines with prospects of continued prosperity for a long time to come.

Considerable anxiety, however, is felt regarding the railroad situation. If a strike should occur at this time the metal industry would be sadly affected, the same as all other lines in this city. Inability to obtain fuel would be one of the worst features. Many concerns, however, have been buying heavily in this line in anticipation of what might occur. About the only outlet would be by the Great Lakes and so long as the boats run, Detroit would be more favored than those cities inland.

Another difficulty that seems almost inevitable within the next few months, is lack of freight cars, which will be felt as soon as the western grain and other crops begin to move. This condition is looked upon quite seriously and is causing more or less anxiety.

The automobile business requires a great number of freight cars and when the supply grows short, serious trouble is faced.

The Clayton Lambert Company is one of the busiest brass manufacturing concerns in the city. It is still working on war contracts and is turning out shells in great numbers. Many other concerns are doing the same, and at the present time giving employment to a large number of persons, including women and girls.

The labor situation is quite acute, and since the extreme hot weather has prevailed employers are unable to obtain sufficient help. One local concern manufacturing trolley wheels has been seriously handicapped in this regard. Skilled and unskilled workmen are in demand and wages never were so high as they are at present.

The local shipbuilding yards, which maintain substantial brass foundries, are rushed with work. A larger number of contracts are under way. The Detroit Ship Building Company recently completed two ocean ships for a Norwegian company. Three others are well under way and it is expected they will be ready to leave the lakes by way of the Welland Canal before the season closes. Contracts are said to be booked that will keep the company busy

for at least another year on lake boats alone, with prospects of further orders for ocean craft. Much brass and copper are used on all these boats.—F. J. H.

LOUISVILLE, KY.

SEPTEMBER 1, 1916.

Things have quieted down somewhat with the Louisville coppersmiths during the past month. Several of the houses, which had been working on big distiller contracts, have completed their jobs, and are now awaiting the annual rush of distillery work which starts the latter part of September, and lasts through October and November. Most of the local concerns report that the outlook for fall business is good, and while business just now is light this condition is not expected to last very long.

Sheet copper slumped off during the month to 35 cents a pound, base price, but regained again and is now quoted at 37½c. delivered in Louisville in quantities. The demand just now is rather light, most of the concerns having little work to do, and a fair stock on hand. Tubes, base price, are quoted at 41½c.; and ingot copper, mines, 27c.; Louisville, 30c.; scrap copper is selling at about 19¾c. per lb.; scrap brass at 16@17c. according to weight; tin at 40c.; lead, 6½@7c., and solder, 25c. per lb. Deliveries are somewhat quicker and more certain, sheet being had from the mills in two to four weeks, and tubes in four to six weeks.

Hines & Ritchey report that they have cleaned up all of their big distillery contracts, and at present have very little work of any kind in the shop, but are getting ready for active business during the latter part of September.

G. W. Buschemeyer, Sr., worker in precious metals, reports that on account of the high cost of platinum, there has been a big demand during the past few months for white gold, an alloy of gold and silver. This alloy does not tarnish, and looks so much like platinum that only an expert can tell the difference. Many customers are now ordering work made up in white gold instead of platinum. Mr. Buschemeyer has taken additional floor space in the Starks building, and is opening a retail department to handle jewelry and jewelry repair work, engraving, mounting, diamond setting, etc.

The demand from foundries, shipyards, smelters, rolling mills, etc., for firebrick, has been so great that the Louisville Firebrick Works, has been forced to enlarge its plants at both Louisville, and Grahn, Ky. This company also has an enormous Government contract, running into a year's supply.

During the past few months labor has been so scarce among the coppersmiths that several of the concerns were forced to send one or two good copper workers out on a job, with a few untrained men working under them. The result has been that the available supply of trained workers has been increased, and unless business picks up again there should be no great shortage of labor this winter.

With most of the copper working concerns of Louisville carrying fair supplies of material on hand, the threatened trainmen's strike has not given them the amount of worry that has been experienced in other lines. However, a strike at this time would inconvenience everyone, and it is hoped that the trouble may be averted. Scrap material has been fairly well cleaned up lately, and in case of a long tie up, new material would have to be used. G. D. C.

HOPEWELL, VA.

SEPTEMBER 1, 1916.

Hopewell, the great Guncotton City, has been called the "City of Opportunities." Today wide-awake men can find chances on every side to make money. Less than 20 months ago Hopewell was unknown, the inhabitants of this and the surrounding country being engaged in the peaceful pursuit of cultivating the land for peanuts and corn. Today the "Wonder City" has a population of approximately 30,000, and modern office buildings, banks, etc., greet the vistor on every hand.

Of course the famous Dupont plant is the "hub" of Hopewell. The plant is now running full capacity, with an estimated number of 20,000 employees, and a payroll of something in the neighborhood of $1,000,000 per month. The plant has been hiring men by the hundreds daily, and there has been no difficulty in securing employment. In fact there has been a scarcity of labor, and the employment agent of the plant has been obliged to make visits to near-by states to secure the necessary help.

The work is easy and the wages good. It is reported that there is sufficient work on hand to keep the plant going at full capacity for the next six months.

Hopewell would appear to offer good opportunity to those engaged in the various metal lines. Particularly is this true of those handling old material. The fire of December last practically wiped out Hopewell, and as a consequence scrap iron and other like material is to be found scattered around in piles throughout the city. This could be had in most instances for the mere asking, the land owners being glad to have it removed.

The Hopewell Board of Trade, which has been recently organized, is conducting a campaign for the purpose of getting new industries and manufacturing plants to locate in Hopewell. With the offer of free building sites and other inducements, it is hoped that their efforts will meet with success. The City of Petersburg, which is the nearest city of importance to Hopewell, being but a few minutes' ride, is making strenuous efforts to have the proposed $11,000,000 armor-plate plant located there. Should this be done, it will no doubt give a stimulus to the City of Hopewell.

The Hopewell Board of Trade will be glad to furnish any desired information to persons interested in the erection of manufacturing plants here. Hopewell has admirable railroad and water facilities, and it is believed that within a short time many new enterprises will be seen here.

A general improvement in business is noted in Hopewell and hereabouts, and it is believed that with the coming of cool weather there will be a genuine increase in business all along the line. J. J. M.

TRENTON, N. J.

SEPTEMBER 1, 1916.

With the closing of summer, manufacturers in the metal industry line report a good season and with prospects ahead for a good winter. Despite the high prices of metal during the past season, business has remained good and this is a sure sign of prosperity. After having been closed down for several weeks in its munitions' department, the Jordon L. Mott Company has begun operations again and is now working on its second big order for shells for the European countries.

The Skillman Hardware Manufacturing Company expects to be busy all winter from the present prospects. The Skillman company has never worked on war munitions and does not care to ever figure on any such proposition. One of the principal articles turned out by the company is brass locks of all descriptions.

The Billingham Brass and Machine Company continues busy and the company recently had to advertise for additional brass workers. President Philip Billingham says he expects business to be good all winter from present prospects.

John Apple had installed an electric plating plant in the rear of his business house on North Clinton avenue. He says business is good.

John W. Metz, president of the National Electrical Plating Works, reports that he is holding his own for this time of the year. He says that he has had a very good season so far and despite the high prices of metals has turned out some good sized jobs.

The Trenton Brass and Machine Company, the McFarland Foundry and Machine Company, the Bechtel Engraving Company, Trenton Smelting and Refining Company, the Mercer Automobile Company and the Clifford Novelty Works all report business encouraging along the metal lines.—C. A. L.

NEWARK, N. J.

SEPTEMBER 1, 1916.

Business, though a little slower than two or three months ago, is very good for this season of the year, and practically all the manufacturers are very optimistic as to the fall and winter—provided the European war keeps up. This explains a lot. The metal business, as many other lines, is both greatly stimulated and greatly checked by the war. There is

a considerable divergence of opinion as to just how much of the present good business is due to the war and how much is due to better general conditions, and just as great a difference of opinion as to what the effect of the stopping of the war would have on business. Some hold that most of the good business of today is due to the unprecedented manufacture of war munitions, even though some lines seem so indirectly connected with the traffic as to be practically independent. Such persons hold that when the war stops the munition business will stop, and all business will be affected adversely. Others admit that business has been greatly stimulated by war orders, but that big crops and other causes also enter into the account, and that while there doubtless would be more or less of an adjustment in case of the stopping of the war, that business in general has acquired a momentum during the past year that would carry it through this trying time.

A year ago, though business was beginning to look up, there was a general lack of confidence that held business back. Bankers would not lend to manufacturers, except on almost prohibitive terms, and manufacturers dared not take business chances, that under normal conditions they would not have hesitated to have taken. Now confidence has been largely restored, though there is just enough uncertainty left to beget a spirit of caution. Confidence is one of the fundamentals of business. Therefore many manufacturers feel that business will continue to be good, even if the stimulus of big munition orders is removed. Some figure that owing to the depleted stocks abroad, and the greater effort at preparedness in this country, that there will be a considerable business in war munitions for a year or two after the close of the war, and that this will help bridge over whatever business disturbance there may be due to the stopping of the war. Certain it is, however, that this summer has been an unusually good one with manufacturers of different kinds of metal goods. Many of them have to go back several years, some of them six and eight years or more, to find another summer that equalled it in the volume of business. But it is here that the adverse effects of the war are seen. Owing to the inordinate demand for many of the basic materials—both metals and chemicals—the manufacturers of metal goods have been hard put to it to get sufficient materials to fill orders. Some are just getting materials ordered last January, February, March and April. The prices are high and are continually going higher, and manufacturers do not know whether to lay in a stock at present prices, to avoid paying more later, or to order from hand to mouth for the present, to avoid the possibility of buying heavily on a market about to fall.

Owing to the congested transportation conditions, due to the handling of so much war stuff, manufacturers are not able to make prompt deliveries in many instances, even after the goods have been manufactured. While the volume of business has been increasing, their profits have been decreasing, excepting where it has been possible to entirely cover this shrinkage by the increases in the prices of the finished products. In some cases it has been possible to pass on to the retailer and consumer all of the increased cost of material. The labor problem has been one which has bothered manufacturers a great deal. Higher wages have been asked in many lines. Besides that, such has been the demand for both skilled and unskilled labor by the munition factories, that in almost all other lines there has been an ever-growing complaint of a lack of help to get out orders on hand. Some manufacturers keep a standing advertisement for help in the newspapers. There is a general feeling in the metal trade that jewelry manufacturers will have all they can do during the coming fall, and the manufacturers are cautiously preparing for big business.

Platinum, which a few weeks ago went down to $50 from the high point of $110, which it touched last winter, is gradually going up again, now being about $65. Silver is holding its own, fluctuating a little, but not losing the gains it recently made. Assayers, refiners and smelters of Newark, whose busiest season is from early July until about the middle of August, had an exceptionally good season this year. Things are now a little quieter than they were, but remain good for this season. Platers are reporting lots of work, though many complain that they are not getting the profits that the volume of business they are doing should warrant. Collections are much easier than they were a year ago and are approximating a normal condition. R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The International Nickel Company has purchased two large tracts of land at Bayonne, N. J., and will enlarge its plant at a cost of about $500,000.

The Southington Hardware Company, Southington, Conn., has awarded a contract for the erection of two one-story additions, 40 x 144 feet and 40 x 120 feet.

An addition to the foundry of the Canadian Hanson & Van Winkle Company, Limited, 15 Morrow avenue, Toronto, Canada, is being erected at a cost of $7,500.

The National Scale Company, Chicopee Falls, Mass., is erecting a concrete building which will be used for its newly established metal stamping department.

The Titanium Alloy Manufacturing Company, Niagara Falls, N. Y., has awarded the contract for a two-story machine shop which is estimated to cost $30,000.

The Rome Brass and Copper Company, Rome, N. Y., are sending out cards announcing that price schedules No. 69 issued by them have been revised to date.

A. G. Kroos, of the Kohler Company, manufacturer of plumbing goods and enameled ware, Kohler, Wis., advises that that company is not contemplating the erection of a one-story addition as was reported.

The North & Judd Manufacturing Company, New Britain, Conn., has purchased land opposite its present factory as a site for a future building, although no definite plans have been made for building.

The Waynesboro Foundry & Machine Company, Waynesboro, Pa., is contemplating installing a new line of foundry equipment for the manufacture of a brass specialty. The company operates a brass, bronze and aluminum foundry.

The West Bend Aluminum Company, West Bend, Wis., manufacturer of kitchen utensils, drawn work, etc., will open its plant about the first of September after being shut down for about four weeks. The closing of the plant was largely due to repairing and the installing of new machinery.

The Jonathan Bartley Crucible Company, manufacturer of crucibles, Trenton, N. J., is erecting a three-story addition to its plant on Oxford street and is installing additional machinery together with sufficient kilns to practically double its capacity.

E. Blassett & Company, electroplaters, Burlington, Vt., recently purchased the equipment and good will of the Lyndonville Electroplating Works, Lyndonville, Vt. The plating and polishing departments of the Blassett company have been considerably enlarged and they are equipped to do all kinds of metal finishing and plating.

The Gehnrich Indirect Heat Oven Company, Inc., 60-62 Franklin avenue, Brooklyn, N. Y., has received an order for a battery of twelve Gehnrich indirect heated radiator type ovens from the H. H. Franklin Manufacturing Company, Syracuse, N. Y. This is a duplicate of the Gehnrich ovens installed at this plant a year ago.

Ireland & Matthews Manufacturing Company, manufacturers of sheet metal goods, Detroit, Mich., has awarded the contract for a factory at Beard and Green avenues. The company operates a brass foundry, brass machine shop, tool room, cutting-up shop, spinning, stamping, brazing, soldering, plating, polishing and lacquering departments.

The Macungie Brass & Manufacturing Company, Macungie, Pa., will erect an additional building, 50 x 120 feet, to be used as a foundry for jobbing work and builders' hardware. It will give employment to about 25 additional molders. A brass, bronze and aluminum foundry, brass machine shop and grinding room are operated by this company.

The National Company, manufacturers of seamless tubing, Waterbury, Conn., is enlarging its main building which is now 100 x 70 feet with an addition of 150 x 70 feet, with a projection at the end for muffle purposes, 50 x 70 feet. The increase in the size of the building will mean an increase of approximately 200 per cent. in the company's production.

The Canister Company, Phillipsburg, N. J., has filed a petition in bankruptcy in the United States Court here. The liabilities are $432,712.43, while the assets are $273,756. The company had been working on a big order for brass shells for the Eddystone Amunition Corporation, of Eddystone, Pa., and failed before the contract was completed.

The Buffalo Metal Products Manufacturing Company, which was recently incorporated with a capital stock of $50,000, Buffalo, N. Y., has completed a temporary manufacturing plant at Humboldt Parkway and East Delavan avenue for the manufacture of pressed steel parts. The company expects to increase its capacity shortly by putting up an additional concrete or brick structure.

The Apothecaries Hall Company, 18 Benedict St., Waterbury, Conn., announce that they are offering to the trade nickel or copper wire anode hooks insulated with Bakelite so that the anodes to which they are attached can be completely immersed in the solution without the hooks being attacked. They state that an anode can thus be completely used up without leaving any scrap.

The Brass Specialty Manufacturing Company, 1641 North Tenth street, Philadelphia, Pa., plans to enlarge its plant to take care of the increasing demand for pressed and spun metal specialties, and will also put on a night shift. The company operates a brass machine shop, tool and grinding room, and spinning, stamping, brazing, soldering, plating, polishing and lacquering departments.

A tin-concentrating and smelting plant for the An-Yuan mines in Hunan Province, southern China, is shortly to be placed in commission by the Wah Chang Mining & Smelting Company, Ltd., which will offer the product for sale in New York (offices in the Woolworth Building) and through agencies in Europe. These mines are in the Ichanghsien district and contain both oxide and sulphide ores.

The Edward Miller Company, Meriden, Conn., is constructing an addition to its brass rolling mill which will increase the capacity of the mill and also increase the efficiency of the cutting-up and manufacturing departments. Besides a brass rolling mill this company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, casting shop, cutting-up shop, spinning, stamping, brazing, soldering, polishing, plating, japanning and lacquering departments.

The Enterprise Brass Works, manufacturers of plumbers' brass goods, brass, bronze and aluminum castings, Muskegon, Mich., has started a three-story brick and steel addition, 50 x 150 feet, making a total addition of 22,500 square feet of floor space to be devoted to the casting and machining of plumbing fixtures. Hitherto the company has been limited, by lack of room, to the making of the castings, but hereafter the finished product will be turned out here.

The first annual outing and field day of the Benedict Manufacturing Company, manufacturers of silver plated ware and metal goods, East Syracuse, N. Y., was held on Saturday, August 19 at Owasco Lake, N. Y. About 300 of the Benedict employees attended the outing. The members of the general committee were Harry L. Benedict, chairman; R. B. Roantree, treasurer of the company, treasurer, and W. J. Hanlon, chairman of the transportation committee.

The W. M. Sharp Manufacturing Company, Binghampton, N. Y., which was formed a short time ago by the consolidation of the Binghampton Plating Works and the dental specialty business carried on by Dr. W. M. Sharp, has been incorporated with the following officers in charge: Dr. C. T. Kinsman, president and general manager; A. G. Snow, vice-president; Hugh M. Smith, secretary and treasurer. A building has been purchased and fully equipped with up-to-date machinery and with these added improvements will be able to do better work than ever in the gold, silver, nickel, copper and brass plating oxidizing and lacquering business.

The Buffalo Copper and Brass Rolling Mills, Buffalo, N. Y., has purchased the Bridgeport Crucible Company, Bridgeport, Conn., together with its subsidiary, the Taunton Crucible Company, Taunton, Mass. The Buffalo Company, which it is stated, is the largest single user of crucibles in this country, has been negotiating for the purchase of the Bridgeport business for some time to protect its crucible supply.

The present output of the Bridgeport plant is 1,800 crucibles a day and its yearly sales are reported to exceed $4,000,000. The Bridgeport Crucible Company was founded in 1887 by W. T. Macfarlane, who will continue for a period with the new owners in an advisory capacity. His son, W. A. Macfarlane, will continue as active manager of the plant.

IMPORTED CRUCIBLES

Contracts for supplying crucibles from abroad are being made by the Crucible Department of the Niagara Falls (Ont.) G. & P. Company, Room 1854, 52 Church street, New York, and deliveries on contracts have already begun. Some of the largest crucible consumers, it is stated, recognizing the superiority of the foreign crucibles have contracted for many thousands of them for delivery during the Fall and Winter months. The importers state that while their crucibles cost more than American crucibles they outlast the latter by many melts and therefore are cheaper in the end.

MONARCH ENGINEERING & MANUFACTURING COMPANY'S EXHIBIT AT CLEVELAND

The Monarch Engineering & Manufacturing Company, Baltimore, Md., report that their exhibit at the Cleveland Exhibition of foundry supplies and materials September 11 to 16, will include a battery of improved core ovens of various types used with oil, gas, coal or coke as fuel and also their full line of furnaces, including a No. 60 stationary oil furnace, No. 125 tilting oil furnace, No. 150 tilting coke furnace, No. 92 simplex and No. 1 double chamber furnace. The comany will be represented by H. D. Harvey, James J. Allen, W. Raber and F. Maujean.

NEW JERSEY ZINC COMPANY REPORT

Net earnings of New Jersey Zinc Company, New York, N. Y., for the quarter ended June 30, applicable to the $35,000,000 capital stock, was $8,735,292, or $23.96 a share, compared with $8,446,385, or $24.15 a share, in the quarter ended March 31, 1916. Earnings in the latest quarter were the largest in the history of the company. The company was organized in 1880, and from that time until the earnings the first three months of 1916 were published, stockholders are said to have never been officially informed as to earnings. The lack was made up, however, by various large dividends from time to time.

The fifty-two per cent. dividends so far this year represent a cash distribution of $18,200,000. Balance for the six months, after dividends, was $3,881,677, equal to $11 a share. The controller

of the company informs stockholders that these unusually large profits are "due to abnormal trade conditions and must not be regarded as an index on normal earnings." The company's chief profits have resulted from the abnormal demand for its Horsehead brand zinc which, with Calumet & Hecla copper, is said to be favored in the manufacture of brass for munitions.

REMOVALS

The General Chemical Company, manufacturer of phosphor bronze, copper, tin, etc., announces the removal of its offices from 712 Lafayette Building to the Morris Building, 1421 Chestnut street, Philadelphia, Pa.

The American Brass Forging Company, Inc., and the New York Piano Hardware Company, formerly located at 120 Broadway, on September 1 removed their executive office to their factory at 168 Southern Boulevard, New York, N. Y.

FOREIGN TRADE OPPORTUNITIES

For addresses of these inquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

Brass No. 22,110.—A merchant in Spain informs an American consular officer that he desires to import wholesale quantities of annealed brass in sheets for the manufacture of electric-lamp sockets. Correspondence in English. References.

Metal tubes and sheets, No. 22,185.—An American consular officer in Spain writes that a firm in his district wishes to represent American manufacturers and exporters of brass, copper and zinc in tubes and sheets. Correspondence in English. References.

Copper wire, etc., No. 22,211.—The commercial attaché of the Department of Commerce in France reports that the head of an organization in Switzerland is in the market for the following metals for use in Swiss manufactures: Copper wire for motors, German silver in sheets and bars, nickel of the greatest purity. Full particulars should be stated as to time of delivery, discounts, etc. The purchaser is prepared to pay cash.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To deal in hardware and builders' and plumbers' supplies.—Lewis and Powell Company, Salem, N. J. Capital, $50,000. Incorporators: Arthur B. Smith, Herbert Lewis, Henry M. Powell, Eleazer Smith, Salem, N. J.

To manufacture pumps and brass valves.—Chemical Pump and Valve Company, Jersey City, N. J. Capital, $30,000. Incorporators: Frank O. Warter, Emil Warter, Perth Amboy, N. J.; Fred Batzel, South Amboy, N. J.

INCREASE OF CAPITAL STOCK

The Aluminum Plated Ware Company, 784 South Broad street, Newark, N. J., has increased its capital stock from $100,000 to $150,000.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Red Lead.—The National Lead Company, New York, N. Y., has issued a booklet written by G. W. Thompson on "Why Highly Oxidized Red Lead Is Superior." The reasons why lead in this form is superior to any other are forcibly and clearly set forth by Mr. Thompson. The work makes interesting reading for anyone who has occasion to use red lead.

Chemical Engineering.—The University of Michigan at Ann Arbor, Michigan, has issued a bulletin in which they give particulars relating to their course in chemical engineering. The Detroit Edison Company has endowed a fellowship course in this university which is open to graduates of any university. Professor Alfred White, of the University of Michigan, may be addressed for particulars regarding this course.

Alloys.—R. A. Wood, the well-known brass rolling mill expert, Cheshire, Conn., has issued twenty-four new sheets to be added to his book, "The Waterbury Book of Alloys." The new sheets describe the manufacture of brass for shrapnel shells and constitutes a complete description of the most modern methods for the production of this important material.

Cost Systems.—Two very interesting and valuable booklets have been issued by the Federal Trade Commission of the United States, Washington, D. C., under the dates of July 1 and 15 respectively. These booklets are "A System of Accounts for Retail Merchants" and "The Fundamentals of a Cost System for Manufacturers." Either or both of these works may be obtained by corresponding with the Commission.

Magnetic Separators.—The Magnetic Manufacturing Company, Milwaukee, Wis., have issued bulletin No. 6 which is devoted to magnetic separators for brass founders and metal refiners. These separators comprise a line of standard machines, belt and motor driven, and also a line of special intensity machines for mining smelters and reduction plants. Copies of the booklet may be had upon request.

Gold Alloys.—Herpers Brothers, Newark, N. J., have issued a most interesting little booklet giving the formulae for alloying all the gold used in the manufacture of their settings, patent safety catches and other jewelers' findings. These formulae comprise all the various karat golds from ten to eighteen and also include formulae for the various classes of karat solder used for the different karat golds. There is also included directions for the melting and working of white gold.

Copper Anodes.—The U. T. Hungerford Brass and Copper Company, New York, N. Y., is sending out printed cards announcing that they have in stock for immediate shipment "Star Brand" copper anodes, which they state are manufactured from copper especially selected for such anodes and that every plate is guaranteed to give satisfaction. Size of anode carried in stock is 18 x 25 x ⅜ inches with ½-inch round holes in all four corners. Other sizes can be furnished promptly.

Safety Balancing Washer.—The Munning-Loeb Company, Matawan, N. J., has published a small booklet describing their safety balancing washer. This balancing washer is represented as both a safety device and time saver in the balancing of buffs and polishing wheels. It does away with the hazardous method of balancing by attaching chunks of lead, nails and screws to the light side of a wheel and enables the operator to perfectly balance a wheel in less time than it takes to tell about it. A copy of this booklet will be sent on request.

Metal Cyanides.—The Roessler & Hasslacher Chemical Company, New York, N. Y., have just issued a booklet entitled "The Economy and Efficiency of the Metal Cyanides for Plating Solutions." This booklet contains recipes for copper, brass and silver solutions and also contains the formula for the alkaline zinc

solution for steel and steel products. The formula for the zinc solution is the result of extensive experiments extending over the past year, and in view of the excellent results obtained will certainly be interesting to every manufacturer of steel products that are to be zinc plated and protected against rust and atmospheric influences. This booklet will be sent to all interested parties on request.

Oil Filters.—Bulletin N. 5, "Oil Filter," recently issued by the Richardson-Phenix Company, Milwaukee, Wisconsin, describes a complete line of filters for purifying lubricating oil, having capacities of from 25 gallons per day to 50,000 gallons per hour. This is said to be the most complete oil filter catalog ever issued and describes some exceedingly interesting large size filters for use in purifying lubricating oil from water wheel thrust bearings, large gas and steam engines in steel mills and also for purifying cutting lubricants.

SPELTER RULING

At a meeting of the Board of Managers of the New York Metal Exchange held August 31, 1916, upon recommendation of the Spelter Committee, the following ruling, defining what constitutes a good delivery on contracts for "Prime Western Spelter," was adopted:

"Prime Western Spelter" shall be Virgin Spelter resulting from the distillation of zinciferous material and shall not contain on the average, in excess of 2% Lead and .08% Iron.

In case of dispute one slab out of every ten shall constitute a proper sample.

Remelted Spelter shall not be a good delivery.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REPORT

NEW YORK, August 31, corrected to September 1, 1916.

COPPER.

The copper market held very firm during the month of August, and some good business was done, mostly with home consumers, for the last quarter of 1916. The Russian government was reported to have bought about 10,000 tons of copper, and there were also reports of other good export orders having been placed. Home consumers continued to place large orders, and the buying movement took on further strength on a report that the British and French governments were negotiating for a purchase of 250,000 tons of electrolytic copper for 1917 delivery. At the time of writing this foreign business had not developed, but on the strength of this report the large producers have been able to dispose of from possibly 200,000,000 to 300,000,000 pounds of copper that had been accumulating over the dull period of May and June. At the same time the big producers have been able to establish a fairly strong market at an advance of a cent a pound over the prices ruling at the beginning of August. The exports are showing the business that was placed earlier in the year. The exports for the month will be fully up to, say, 65,000,000 pounds.

Prices at the close of the month for electrolytic are around 28 for prompt deliveries to about 26½ to 27 cents for the last quarter of the year. Lake copper is offered at 27½ cents, and casting at 25⅛ to 25¼.

TIN.

The tin market has held fairly steady at around 37¾, the low point, to 39 cents, the high point, for the month, closing at 38½ cents.

LEAD.

The trust price for lead early in August was 6.50 New York basis, the independent sellers taking orders at 6¼; the trust later dropped the price to 6 cents for about two weeks, and then advanced it again to 6½ cents, apparently on the closing of some big export business and the better feeling in the spelter and copper markets. Lead closes at 6½ to 6¾ New York basis.

SPELTER.

The price of spelter opened at around 9⅜ cents New York, and later declined to 8½ cents; later prices advanced again to 9¾ and closed at 10 cents New York at the end of August.

ANTIMONY.

Chinese-Japanese antimony was selling at 13 cents early in August, and prices later declined to 10½ cents around the middle of the month and then advanced to 14 cents at the end of the month.

ALUMINUM.

The aluminum market has been very dull, and some few carload lots have been traded in at around 60 cents. At the close there are buyers at 61 cents and very little offering below 62 cents.

SILVER.

The silver market has held very steady, and prices have held around 63 and 66 cents New York.

QUICKSILVER.

Prices declined from $80 per flask at the opening to $72 on the 21st, and then a firmer market developed and prices advanced to $77 a flask at the close of the month.

PLATINUM.

The platinum market has been very dull and the price has been held steady at $60 per ounce during the entire month.

SHEET METALS.

After reducing the price of sheet copper 2 cents per pound for a few days, the ring advanced it again to the old price of 37½ cents base for hot rolled and 38½ for cold colled. The wire mills are just as bad; prompt wire is around 33, 34 or 35 cents, if the mills can find out how much you need it; August and early September is quoted at 33 cents, and October at 31¾ cents, and for last quarter of the year electrolytic copper can be bought at 27 cents per pound.

OLD METALS.

There is a good demand for brass scrap for export, and prices have been better owing to the advance in ingot metals.—J. J. A.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper. 1915—Average for year, 18.94. 1916—January, 24.75. February, 27.75. March, 28. April, 29. May, 29⅞. June, 28.25. July, 27.25. August, 27.

Brass Mill Spelter. 1915—Average for year, 17.50. 1916—January, 22.25. February, 22.75. March, 23.15. April, 23.20. May, 21.20. June, 17.40. July, 15.20. August, 13.60.

AUGUST MOVEMENTS IN METALS

	Highest.	Lowest.	Closing.
COPPER.			
Lake	27.25	25.50	27.25
Electrolytic	28.25	25.50	28.00
Casting	25.15	24.25	24.25
TIN	39.40	37.75	38.25
LEAD	6.50	6.00	6.50
SPELTER	9.60	8.40	9.25
ANTIMONY (Chinese and Jap)	14.25	10.50	13.00
SILVER	67.25	64.00	64.00

DAILY METAL PRICES

By an arrangement with the daily metal papers, The Metal Industry can furnish daily metal prices, and we offer a special combination subscription price of $10 per year for this service. The price of the daily paper alone is $10 and of The Metal Industry alone $1.00—combination offer $10.

Metal Prices, September 1, 1916

NEW METALS.	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	27.50
Electrolytic, carload lots	28.00
Casting, carload lots	25.25
TIN—Duty Free.	
Straits of Malacca, carload lots	38.50
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets 20%. Pig lead, carload lots	6.50
SPELTER—Duty 15%.	
Brass Special	12.00
Prime Western, carload lots, nominal	10.00
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory	70.00
100-lb. lots, f. o. b. factory	65.00
Ton lots, f. o. b. factory	62.00
ANTIMONY—Duty 10%.	
Cookson's cask lots, nominal	....
Hallett's cask lots, nominal	....
American	13.50
Chinese, Japanese	13.50
Wah Chang WCC. brand spot	13.50
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot, Placquettes, Ingots, Blocks	45.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	4.00
BISMUTH—Duty free	4.50
CADIUM—Duty free	nominal 1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	75.00
GOLD—Duty free, per ounce	$20.67
PLATINUM—Duty free, per ounce	$60.00
SILVER—Government assay—Duty free, per ounce	.63⅜

INGOT METALS.		Price per lb. Cents.
Silicon Copper, 10%	according to quantity	39 to 41
Silicon Copper, 20%	" "	39 to 42
Silicon Copper, 30% guaranteed	" "	42 to 43
Phosphor Copper, guaranteed 15%	" "	39 to 41
Phosphor Copper, guaranteed 10%	" "	35 to 39
Manganese Copper, 30%, 2% Iron	" "	48 to 53
Phosphor Tin, guaranteed 5%	" "	55 to 60
Phosphor Tin, no guarantee	" "	45 to 47
Brass Ingot, Yellow	" "	17 to 19
Brass Ingot, Red	" "	21 to 23
Bronze Ingot	" "	21 to 23
Parsons Manganese Bronze Ingots	" "	29½ to 31
Manganese Bronze Castings	" "	28 to 37
Manganese Bronze Ingots	" "	23 to 27
Phosphor Bronze	" "	24 to 26
Casting Aluminum Alloys	" "	50 to 51

PHOSPHORUS—Duty free. According to quantity	35 to 40

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
21.75 to 22.25	Heavy Cut Copper	25.00 to 25.50
20.50 to 21.50	Copper Wire	23.00 to 24.50
18.00 to 18.50	Light Copper	21.50 to 22.50
17.00 to 17.50	Heavy Mach. Comp.	19.00 to 19.50
12.50 to 13.00	Heavy Brass	14.00 to 15.00
10.00 to 10.25	Light Brass	11.50 to 12.50
13.75 to 14.25	No. 1 Yellow Brass Turnings	14.50 to 15.25
14.25 to 15.00	No. 1 Comp. Turnings	15.00 to 16.00
5.00 to 5.50	Heavy Lead	5.75 to 6.00
6.50 to 7.00	Zinc Scrap	7.00 to 7.75
18.00 to 20.00	Scrap Aluminum Turnings	19.50 to 21.00
30.00 to 31.00	Scrap Aluminum, cast alloyed	32.00 to 34.00
40.00 to 42.00	Scrap Aluminum, sheet (new)	45.00 to 47.00
23.00 to 24.00	No. 1 Pewter	25.00 to 28.00
26.00 to 28.00	Old Nickel	30.00 to 32.00
19.00 to 21.00	Old Nickel anodes	22.00 to 24.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 37½c. base net
From stock ..... 39c. base net

SIZE OF SHEETS. Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill, 15.00 cent basis, less 8%	
Casks, jobbers' prices	17
Open casks, jobbers' prices	17½

Metal Prices, September 1, 1916

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect May 10, 1916.

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.40	$0.41	$0.42
Wire	.40	.41	.42
Rod	.40	.42	.43
Brazed tubing	.45	—	.47
Open seam tubing	.45	—	.47
Angles and channels	.45	—	.47

To customers who buy 5,000 lbs. or less per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.42	$0.43	$0.44
Wire	.42	.43	.44
Rod	.42	.44	.45
Brazed tubing	.47	—	.49
Open seam tubing	.47	—	.49
Angles and channels	.47	—	.49

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

30½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	38c.	per lb. base
100 lbs. to 300 lbs. in one order	38½c.	" " "
Less than 100 lbs. in one order	40c.	" " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet	
	Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
⅞ inch		
1 inch		
1⅛ inch		
1¼ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	42c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	38c.	" "
Muntz or Yellow Metal Rectangular sheets other than sheathing	41c.	" "
Muntz or Yellow Metal Rod	39½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 58c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over, 25 to 50 lbs. 9c. over, less than 25 lbs. 15c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	30-48			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ in.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	16%	48c.
8%	45½c.	18%	48½c.
10%	46c.	20%	51c.
12%	47c.	25%	60c.
15%	47½c.	30%	66c.

GERMAN SILVER WIRE.

Quality	Net per lb.	Quality.	Net per lb.
5%	47c.	15%	53¾c.
8%	49c.	16%	54¼c.
10%	50½c.	18%	56¼c.
12%	52¼c.	30%	71½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.